The added value of FABs

A generic Cost-Benefit Analysis

DOCUMENT SUMMARY

Objective:	To provide an idea and estimation on the added value of FABs		
Origin:	Inter-FAB Initiative	**Audience**:	Inter-FAB & public

Title:	The added value of FABs – a generic Cost-Benefit Analysis
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EXECUTIVE SUMMARY

In 2015, all nine FABs jointly agreed to coordinate their activities, to share experiences at FAB level in order to deliver SES, to formulate common goals on the challenges that FABs are currently facing and to collectively have a strong and cohesive voice in Europe by establishing the InterFAB coordination platform.

In February 2018, 5 FAB initiatives (BALTIC FAB, BLUE MED FAB, DANUBE FAB, FAB CE and FABEC) decided to initiate a study on “The added value of FABs – A generic Cost-Benefit Analysis” with the high-level objective to answer the following questions:

- Do FABs create added value or not?
- Are FABs supporting the implementation of SES?

while taking, of course, in due consideration the overall coordination costs borne by FABs. In this regard, it has been calculated that the costs for administering FABs amounts to EUR 5 Mio p.a. On average, 2 FTE are needed for the administration of each FAB.

The study shows that FABs create added value in three respects:

- A qualitative added value specifically in the KPAs of Safety, Capacity and Environment, but also in Cost Effectiveness.

  FABs are conducting or planning some 77 projects and activities (65 in the ANSPs’ domain, 12 in the States’ domain) leading to positive qualitative results and in some cases to quantitative results.

  Of the 77 activities captured, all of which contributing to the performance of the 5 FABs participating in the study

  - 14 activities increase the safety level;
  - 15 activities increase capacity;
  - 16 activities support environmental targets;
  - 6 activities increase efficiency.
- A quantitative added value where the needed data was available and could be integrated into this study

  For the quantitative benefit analysis only studies from third parties (Network Manager and SESAR) have been taken into account whereas the qualitative assessments have been done by expert judgement.
- Most FABs have integrated the Military into their structure although they are not included in the SES regulations.

The study shows that FABs play an important role in facilitating and accelerating activities, whether they are implemented individually or as common projects. In addition, there is a considerable amount of engagement at inter-FAB level where several FABs work and cooperate together; again this impacts almost all domains.

Another outcome of the study is the good level of cooperation among States, NSAs and ANSPs both within each FABs and at Inter-FAB level.

The study starts with a background answering the most relevant questions and it is structured in three parts.

Part I provides an overview of the typical organization of FABs and some detailed information on how activities and projects are assessed.

Part II offers a long collection of all the projects and activities implemented or due for implementation in the various FABs. Each activity is described and qualitatively assessed. The end of part II provides an overview of the costs also.

In Part III the added value of FABs has been calculated as net present value.

According to the study's assumption, the results of the CBA model in terms of costs, benefits and related Net Present Value (NPV) from the base year 2014 until 2029 is **1.604M€**.

BACKGROUND

What are FABs?

A Functional Airspace Block (FAB) means "an airspace block based on operational requirements and established regardless of State boundaries, where the provision of air navigation services and related functions are performance-driven and optimized with a view to introducing, in each functional airspace block, enhanced cooperation among air navigation service providers." The projects and activities presented in this study show that the FABs are fulfilling the requirements and are providing added value.

Are FABs homogeneous?

The FABs participating in this study show that there is not one valid pattern of a FAB. Whereas some FABs have two members, others have up to seven members. Although they all seem to serve a specific traffic flow, they are very heterogeneous in terms of share of overflights respectively domestic traffic and traffic volatility as well as complexity. In addition due to its history the organization and tasks of the different Air Navigation Service Providers involved differ: e.g. some include meteorological activities and some have military tasks. However, to some respect FABs are also homogeneous as the way FAB is organized and its structure and decision mechanisms are very alike to each other and none of the FABs has intentions to modify them in the future. For the tasks and activities FABs conduct there is a rather mixed picture: some activities and projects are shared even on an inter-FAB level whereas others are quite specific following the different challenges the FABs face.

What is Inter-FAB and its Performance Initiative?

With the idea of assessing and discussing the potential of Inter-FAB cooperation / coordination the Dutch presidency of FAB in 2014 organised a first workshop that brought together State representatives of all nine Functional Airspace Blocks (FABs) in Amsterdam on 18 and 19 November 2014. The workshop created an informal platform to exchange FAB-related information, to share various successful approaches and gained experiences. In order to explore how Inter-FAB coordination could be further developed, Danube FAB offered to organise a second Inter-FAB workshop in 2015. In view of its preparation the current Swiss Presidency organised a working meeting in Zurich in March 2015. The conclusion of the Zurich meeting showed amongst other things, support for a yearly event (meeting, workshop) of the FABs on Inter-FAB coordination, a preliminary identification of common fields of interest, the need for a structure to prepare the yearly event and for this purpose the set-up of a coordination group of 9 Point of Contacts (PoCs) as platform to manage the coordination and exchange information. Subsequently a PoC meeting took place in Langen in October 2016 establishing a joint Communication stream and in Malta in October 2017 establishing a joint Performance Stream. The first workshop of the Performance Stream took place on Jan 31st/Feb 1st 2018 in Sofia hosted by Danube FAB and the 2nd workshop was hosted by Baltic FAB on May 17th in Warsaw. FAB CE has organised the following PoC meeting in September 2018 where the added value of FABs was discussed and the approach welcomed: the FABs Baltic FAB, BLUE MED, Danube FAB, FAB CE and FABEC agreed to contribute to the study. The Study was finally approved by the Performance Stream in its third workshop in Rome hosted by BLUE MED on January 30th/31st 2019 and released afterwards.

Is FAB an accelerator or a prerequisite?

The vast amount of different performance activities has shown that it is not possible to differentiate between FAB activities and non-FAB activities, meaning that the activity would have been taken up even if a FAB had never existed. This can be clearly shown for projects which are implemented or in the process to being based on legal requirements: clearly such projects would have been implemented anyhow; however, it is doubtless that the FAB and Inter-FAB platform facilitated and accelerated the implementation. One of the merits of FABs is thus the network which has been created, the trust and confidence from the different levels on States side or/and between ANSPs whether it is the decision or the expert level. Challenges on a national level can be mastered in the FAB in a coordinated way. These benefits are rather qualitative and are thus in this study assessed from a qualitative view.

What can be considered to be FAB costs?

There is no clear definition what the cost of a FAB are and which costs can be assigned to a country or a specific ANSP. In this study it was assumed that the costs of a FAB are its overall coordination costs. Hence, they are the costs which could be saved if there was no FAB.

Subsequently, the costs of a project or an activity are not regarded as a FAB costs as it is assumed that the activities are conducted to achieve a specific benefit. Even, in the event, that there is a budget at FAB level available these figures needed to be assessed as sometimes on FAB level activities are being carried out as they are more cost efficient, such as the conduction of simulations (fast or real-time) or common procurements.

What is the FAB added value?

This study shows that FABs have added value in three respects:

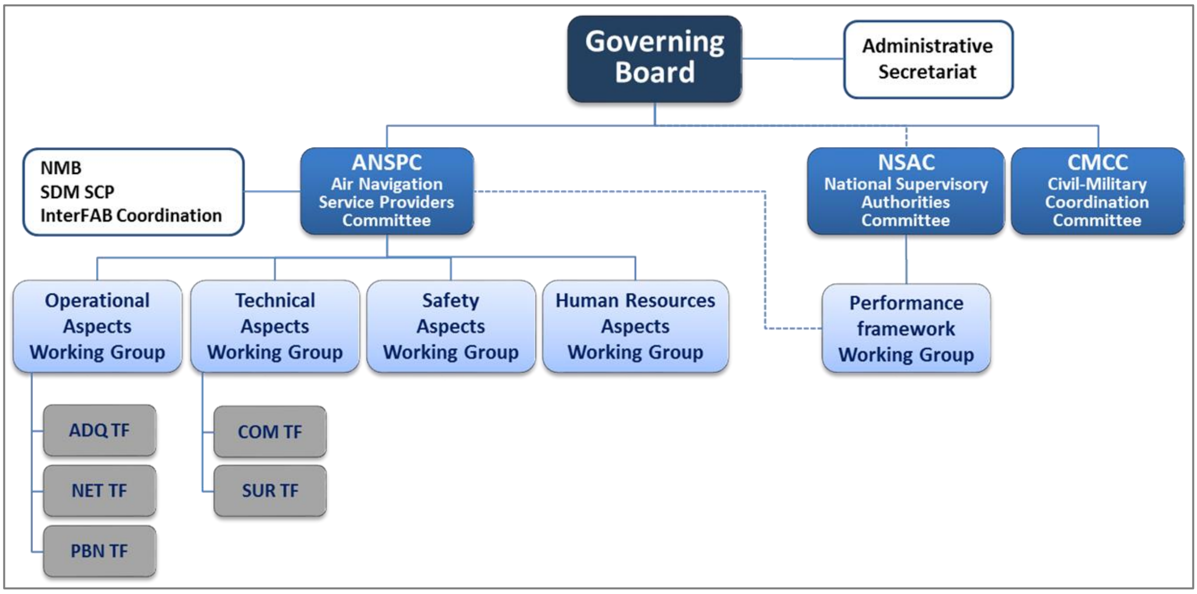
- A qualitative added value specifically in the KPAs of Safety, Capacity and Environment, but also in Cost Effectiveness.
- A quantitative added value where the needed data was available and could be integrated into this study.
- Most FABs have integrated the Military into their structure although they are not included in the SES regulations.

PART I ALLOCATION OF COSTS AND BENEFITS

1 ALLOCATION OF COSTS AND BENEFITS

1.1 Introduction – the typical organization of a FAB

Functional Airspace Blocks (FABs) are a combined States and ANSP effort with different and complimentary roles. Therefore, the organization is typically two-fold with a States side and an ANSP side. Typically, both sides are structured by the different domains, e.g. Operations (other names may be used like e.g. Airspace) or Technology (again other name may be used like e.g. SESAR) just to name two of the domains. Usually, FABs have a kind of centralized secretariat either on States or on ANSP side or having a combined one. The centralized secretariat takes care of coordinating the different activities across the domains, organizing meetings and/or events and may conduct some centralized functions for the whole FAB. These functions may compromise Communication activities, Social Dialogue, the tendering for e.g. CEF Calls or Common Procurements. In some cases FABs use third parties to support or conduct these activities like a consultancy, support from EUROCONTROL or a joint venture.



Graph: Structure of BLUE MED FAB as one example

During the phase of FAB implementation until end of 2012 the European Commission engaged an Inter-FAB Coordinator. While this task ended with the implementation, FABs quickly realized that some kind of exchange of information and best-practises was regarded as beneficial. In 2014 FABs started to engage in Inter-FAB activities and have deepened their relations ever since. Although the activities are mostly on an informal level the Terms of Reference of the Inter-FAB platform have been formally established through the agreement by the representatives of all FABs.

The inter-FAB relations are not necessarily shared amongst all FABs but could compromise a part of them, such as e.g. the agreements between DANUBE FAB with FAB CE or with BLUE MED or the Borealis Initiative with UK-Ireland FAB, DK-SE FAB and NEFAB. Inter-FAB activities have mostly a certain trigger which may be a certain project (e.g. a joint Free Route Airspace) or may provide a framework for a whole bunch of smaller activities contributing to the performance of the European Network.

1.2 *FAB activities*

The organization of a FAB already shows that there are numerous activities as well as in scope and in detail. They may vary considerably according to the needs in the respective FAB which may differ significantly due to their different targets and necessities.

The projects and activities of a FAB are almost exclusively driven by performance – with some very rare exceptions when triggered by legal obligations. Due to the inter-dependency and the seamless operations of the network it is impossible to differentiate which project or activity is only based on the FAB strategy or the one of an ANSP or even a subunit of an ANSP. As the objectives of FABs, ANSPs and their subunits are in a complimentary way, all activities and projects within a FAB and therefore in one of its member states are contributing to the performance of the FAB as such. In this respect any activity contributing to the performance of a FAB is a FAB activity.

1.3 *ANSP activities*

There may be some activities at the ANSP level which are linked by no means with the performance of a FAB. Such activities may be e.g. the one to one replacement of equipment with no influence on any of the Key Performance Areas or the fulfilment of a certain national obligation with no inter-relationship with other activities in other member States or FABs. In this context such activities or projects are not regarded to be a FAB activity.

2 DIFFICULTIES WHEN MAKING A CBA FOR A FAB

A cost-benefit analysis is a certain undertaking in itself. For FABs this may become a challenge as there are several levels involved with different cost categories, different legal frameworks and considerable difference in costs and traffic leading to a spread also on the benefit side. Data can typically only be gathered on the network level as the impact cannot be assessed only on the national or FAB level but rather on the network. Again, the more actors there are involved the more difficult it is to gather a complete picture. Hence, it may be necessary to extrapolate some data or to use some averages in order to obtain a reliable picture.

PART II – FAB ACTIVITIES AND THEIR COSTS AND BENEFITS

1 FAB ACTIVITIES AND THEIR BENEFITS

In this chapter there is a description of all the different activities which contribute to the performance of a FAB or which is being undertaken due to legal obligations. The structure of this chapter is one side differentiated between the different domains and on the same time by the two main actors, the members states and the ANSPs. The benefit will be available if it has been estimated by a third-party in an own performance case with the source being clearly described. If not available, there will be a qualitative assessment based on expert judgement. The latter will be the standard practise as a detailed quantitative performance case would be a relatively big effort with the only benefit of having a figure.

1.1 Operations – States side

1.1.1 Development of an Airspace Policy

Each FAB Airspace Policy has been established by their Member States for the FAB implementation. The FAB Airspace Policy, together with the FAB Performance Plans and the FAB Governance provide the reference framework for the States and ANSPs of a FAB to organise and manage their airspace in order to meet the FAB Treaty objectives and contribute to optimal performance in the areas relating to safety, environmental sustainability, capacity, cost-efficiency, flight efficiency and military mission effectiveness, while addressing stakeholder needs and taking into account the airspace strategy developed by the FAB Air Navigation Service Providers (ANSPs).The FAB Airspace Policy is a reference document for FAB States airspace and/or supervisory authorities and ANSPs. It is developed by the FAB Airspace Committee as a living version controlled document in close cooperation between civil and military authorities and FAB ANSPs.

The FAB Airspace Policy includes general principles relative to airspace organisation, airspace design, airspace management, and air traffic flow and capacity management for FAB airspace to account for different and sometimes diverging rules and procedures within FAB States or ANSPs.

It reaffirms the principle of the flexible use of airspace between civil and military users and provides a set of harmonized booking principles and of civil-military priority rules for FAB airspace management with the objective to improve the flow of civil aviation while ensuring and improving the effectiveness of the military missions.

The FAB Airspace Policy establishes as well processes and procedures relative to the management and implementation of airspace changes within FAB airspace that have a significant impact on FAB airspace or network performance. In particular it establishes a FAB airspace change process to allow FAB States ensure that significant FAB airspace changes are initiated, developed, approved and implemented in a safe and controlled manner, in accordance with the policies and procedures laid down by the FAB Airspace Policy, and that appropriate coordination between FAB States and ANSPs is achieved.

The Airspace Policy also addresses the coordination between FAB and the Network Manager and the role and responsibilities of the FAB Airspace Committee.

Principles and processes established by the FAB Airspace Policy will be applied by FAB States and ANSPs who will align all relevant parts of national airspace policies accordingly.

1.1.2 Review and monitoring of airspace changes

FAB States monitor and provide support to the implementation of airspace changes through the Airspace Committee review and examination of ongoing projects. Main development steps of airspace project are assessed by the AC which, on the basis of a written assessment report, approves the development steps or request modifications.

1.1.3 *Application of the Flexible Use of Airspace*

A set of booking principles and priority rules to be used for airspace management within FAB airspace has been developed.

In addition, the Airspace Committee has identified in concertation with FAB ANSP and the Network Manager relevant elements in the application of the flexible use of airspace (FUA) concept that would need to be harmonized and for which harmonized rules will be developed especially in the light of FRA developments.

A joint State/ANSP Task Force of both civil and military side has been established to support the development of a harmonized application of airspace management and flexible use of airspace in particular to enable the implementation of direct routes and Free Route Airspace.

1.2 Operations – ANSP side

1.2.1 *Multiple Modification of local Approach/Departure Procedures*

FABs are working together with other stakeholders on a local level to optimize noise abatement procedures and reduction of emissions. These measures include:

- Segmented Approach Procedure
- Modification of Transitions to Final Approach
- Modification of SID and/or STAR
- Implementation of Height Limits for Arrivals
- Implementation of ILS with more than 3°.

Examples are:

- FABEC:
  - Frankfurt Approach
  - Departures (SIDs & Y-routes) from Munich towards the south west;
  - Based on relocation of LBV VOR the complete SIDs & STARs at Hamburg airports EDDH & EDHI have to be redesigned;
  - The connection of EDDV to the routes system, SIDs, STARs and routes leading to and from EDDV Hannover shall be redesigned to optimize flows, capacity and environmental effects.

1.2.2 *Night Network*

The night network allows companies to plan authorized direct routing by night-time. It simplifies and shortens routes, thus reducing the CO2 emissions accordingly.

Examples are:

- BLUE MED:
  - CYPRUS: 7 new DCT routes from FL285 up to FL660 available during night time (2100 - 0400 UTC) were implemented in 2017; for 5 of them the availability was further extended to H24 FL285+;

- GREECE: the availability of existing Night DCTs within Hellas UIR was prolonged to 1900-0700 hours.

- DANUBE FAB & Hungary:
  - SEEN FRA project

1.2.3 *Special Events*

FABs in cooperation with EUROCONTROL's Network Manager have increased their coordination and planning efforts to accommodate the handling of heavy traffic and new flight profiles including special new direct routes upfront of a special event like the Olympic Games, European Championships, Summits or the like. This is done in close collaboration with the military partners and is involving – depending on the needs – various FABs. In some instances a dedicated ATFCM/ASM Cell was built up to optimise the performance during the event.

Examples are:

- DANUBE FAB:
  - Capacity enhancement - Airspace optimisation with Black Sea interface. The reorganization provides improved service of the air traffic in the region and conforms to the requirements of the aviation operators for effective flights from Europe to the Middle and the Far East and back.
  - Cross border sectors - implementation of two cross-border sectors on 11th December 2014.

1.2.4 *Reduction of route extension between City Pairs*

City pairs are defined routes between major airports. A reduction of the route extension between some major European airports helps improving flight efficiency and reducing fuel consumption.

Examples are:

- BLUE MED:
  - BLUE MED network optimization: the "Short Track Routings" Project was planned to offer direct links between the main airports located in the BLUE MED FAB, with important hub appendices just close to the Cypriot Airspace's border. Moreover, the "Short Track Routings" Project also fulfills the need to have a conjunction between the Entry/Exit NAV Points of the FRA Airspaces of Italy and Malta and the entry/exit points of surrounding non-Free Route airspaces.

1.2.5 *Earlier use of noise abatement procedures for night*

Within FABs but also beyond ANSPs there is a continuous exchange on noise abatement at airports. The close interaction of procedures, traffic demand and noise immersions lead to local adaption of noise regulations.

Examples are:

- FABEC:
  - noise abatement procedures used during night time at Schiphol and Frankfurt

1.2.6 *Implementation of Volcanic ash procedures*

Cooperation between FAB and NATS on the implementation of procedures to handle volcanic ash situations.

A uniform and standard procedure for adequate measures in case of volcanic ash was established, positively impacting safety and capacity in such case.

1.2.7 *Free Route Airspace*

Description

The FAB Airspace Strategy constitutes the baseline for projects and initiatives to improve Network performance and considers Free Route (FRA) as one of the cornerstones to improve FAB Airspace structure and Airspace utilisation. The FRA projects were launched years ago – originally as a SESAR project – and contribute to the overall FAB performance targets and objectives of increasing Flight Efficiency whilst ensuring Military Mission Effectiveness and Safety. The final objective of the FRA project is to define an airspace within which users may freely plan a route between a defined entry point and a defined exit point, with the possibility to route via intermediate (published or unpublished) way points, without reference to the ATS route network, subject to airspace availability.

The FRA project was reviewed its scope and objectives to comply with the PCP IR. In that respect, the project has made a transition to a more pragmatic approach based on three main work streams developed in parallel, each developing a specific concept:

- National and cross border DCTs
- Long Range Direct Routing (1) including enhanced FUA at FAB level
- Free Routing (or FRA)

(1) *A Long Range Direct Routing is defined as a direct routing which crosses portions of airspace handled by at least 3 ACCs and requires a coordinated FAB approach. A Long Range Direct Routing is composed of several segments of DCT's defined by intermediate waypoints, which allow joining or leaving the defined Long Range Direct Routing.*

High-level objectives

The FRA projects aim at delivering benefits to both airspace users and ANSPs, by improving

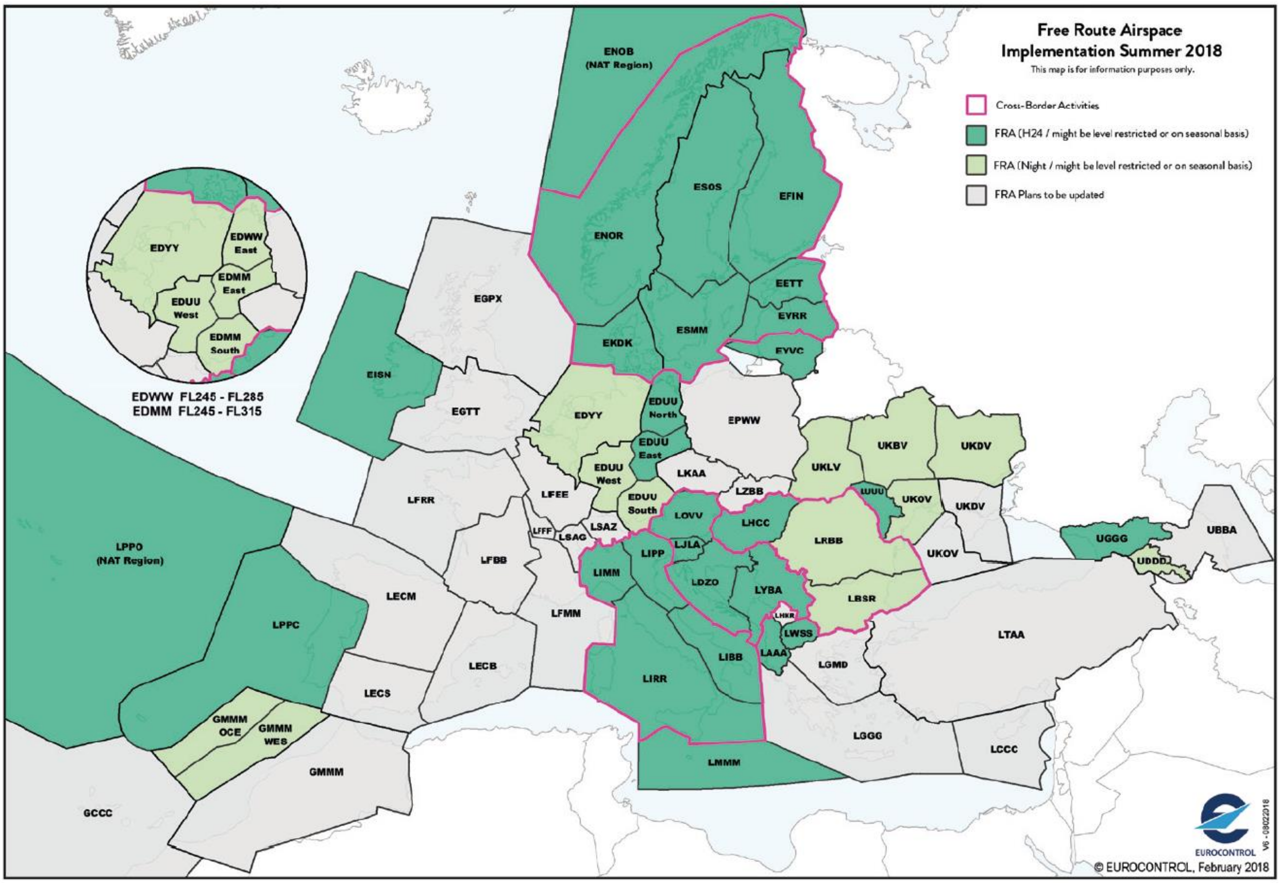
- Horizontal flight efficiency thus reducing fuel burn and environmental emissions
- Flexibility for airspace users and ANSPs by increasing the number of routing options
- Availability of economical routings through making increased use of special use airspace
- Predictability through better compliance to the flight plan

In some FABs the projects also aim at offering DCT's in lower airspace and enhance the in-and-outbound flows with the regional and adjacent airports.

Current Status

Due to traffic complexity and the status of ATM System Implementation the status varies across over Europe. Some FABs have implemented FRA on a national or even the FAB level whereas for other FABs the implementation is ongoing.

As for the status of implementation the Network Manager of EUROCONTROL has gathered the data from all FABs and as for summer 2018 the status is displayed in the graph below.



Examples are:

- FABEC: More than 400 cross-border DCTs were implemented within the Dutch/Belgian/German airspace. The potential benefits from new Cross-border Directs have been assessed by the SAAM network simulation, and amounts over 1.5 Million NM per year, corresponding to a fuel consumption reduction of 30 Million Tons and representing a direct cost saving for the airspace users of up to 7.5 Million EURO. Actual savings are being tracked through the DCT Usage Reporting which shows that over 50% of DCT potential of DCT usage is being used with growing trend.
- BLUE MED: Italy and Malta, anticipating the scheduled deadline and in accordance with EU Regulation, on December 8th 2016 implemented in a coordinated manner the Free Route Airspace (FRA) operations above FL335. In both FIRs, FRA is available H24 for overflights, arrivals and departing traffic. In 2017, FRA implementation resulted in more than ***4,900,000 NM*** reduction of the Planned Route, corresponding to more than ***35,000 tonnes*** of fuel saved and more than ***110,000 tonnes*** of CO_2 emissions less in the atmosphere. From an economical point of view, more than ***€26 million*** were saved. New DCTs implementation in Greece and Cyprus, along with the gradual implementation of multiple DCTs connecting City Pairs among airports in the BLUE MED FAB airspace and close to the boundaries, aims at paving the way to FRA implementation also in these countries by 2022.
- DANUBE FAB: SEE FRA (South-East Free Route Airspace) concept builds on the previous night FRA implementation in the airspaces of Budapest, București and Sofia CTAs. It represents a further step in optimizing flight operations in a large volume of airspace and provides operational, environmental and cost benefits. SEE FRA enables the AOs to plan user preferred trajectories through the use of Significant Points (FRA relevant waypoints and FRA relevant Radio Navigation Aids) published in AIP Bulgaria, AIP Hungary and AIP Romania. SEE FRA also

increases the compatibility between the flight plan and the trajectory flown, hence increasing the predictability for a given flight. FRA is an important element to deliver direct routes for the en-route segment and hence contribute fully to the EU-wide target of en-route horizontal flight efficiency and thus to the realization of the Single European Sky objectives and the achievement of the pan-European ATM performance targets.

- BALTIC FAB: The implementation phase of the 'Establishment of a Free Route Airspace within Baltic FAB' project has been completed in 2017. The project is further being executed as ANSPs FRA projects. Lithuania has completed the FRA project.
- FAB CE: Coordination of FRA implementation

The expected performance contribution is as follows:

- Safety: +
- Environment (Flight Efficiency): ++
- Capacity: ++
- Cost efficiency: -
- Military Mission effectiveness: N/A

Benefits

According to the Network Manager the FAB FRA projects across Europe implemented since 2014 have resulted in €500 million savings for airspace users in fuel costs alone [EUROCONTROL: Skyway No. 68, 2018, page 36].

1.2.8 GBAS

Ground Based Augmentation System (GBAS) is an alternative to Instrument Landing Systems (ILS). According to EUROCONTROL GBAS has a range of benefits:

- With regard to airports, GBAS advanced operations based on increased glide slopes and adaptive runway aiming point are expected to:
- Reduce runway occupancy times and a lower risk of wake vortex problems, due to displaced runway thresholds
- Increase runway throughput in low visibility conditions and adverse weather conditions by supporting reduced spacing on final approach
- Reduce noise concerns in the vicinity of airports through GBAS increase glide slopes and curved approaches

GBAS provides a cost-efficient solution, since only one ground station is needed to service multiple approaches to all runways at an airport.

GBAS-optimised low visibility operations primarily address busy airports with capacity limitations. GBAS advanced procedures can directly support airports seeking to address noise issues and efficient arrival paths.

Passengers can also benefit from the deployment of the GBAS concept as more flights could be flown.

Source: EUROCONTROL, www.eurocontrol.int/gbas

Examples can be found in FABEC, SW FAB as currently GBAS Category I operations are implemented at the following airports:

- Bremen,
- Malaga,
- Frankfurt,
- Zurich.

1.2.9 *Sector Group Re-Design*

The constant change of flows, variation of traffic amounts and modified military needs leads to a change in procedures and to the need to re-design sectors and sometimes sector-groups to adjust to the needs.

Its impact on FAB performance can be described as follows:

- Optimise sector design and configuration of sectors;
- Balance workload in sectors concerned to reduce bottleneck;
- Contribute to optimized safety KPA.

Examples are:

- FABEC: Initiative for restructuring of sector groups in FIR Langen in order to increase work efficiency and flexibility of staff allocation and the optimization of sector design, profiles and procedures after airspace relocation from Munich ACC to Karlsruhe UAC.
- BLUE MED: In Italy, as a consequence of FRA implementation and the lowering of Free Route Airspace to FL305 in close coordination with Malta, an internal project has been launched in order to review the Line of Responsibility (LoR) among the Italian ACCs. Initiatives for restructuring of sector groups in Hellas FIR and Nicosia FIR in order to increase work efficiency and flexibility of staff allocation and the optimization of sector design, profiles and procedures paving the way for Free Route airspace implementation.

1.2.10 *Improvements between FABs / Long-Range*

Inter-FAB initiative to increase entry/exit points in the oceanic area, thus complying with an ICAO request. It includes a modification of the route network and the limits of the involved sectors.

Examples are:

- FABEC / UK-Ireland FAB: initiative involving Brest ACC/UAC, Shanwick and CCMAR Atlantique (French military centre).

Another initiative concerns the optimized DCT routing option on the South-East axis.

Examples are:

- FABEC / FAB CE: This initiative was carried out in close cooperation with MUAC, DFS Karlsruhe, DFS Munich, Austrocontrol and Hungary. It improves environmental performance through the optimisation of horizontal flight efficiency.

Project Case: Fairstream

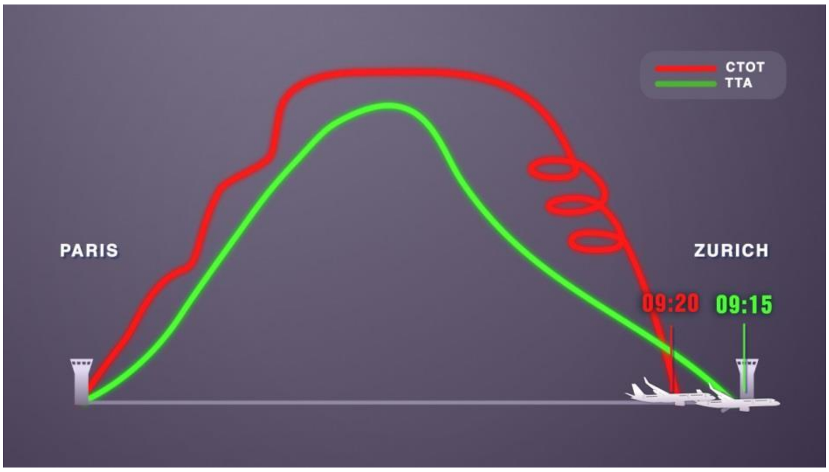
The members of the FAIR STREAM consortium led by DSNA include 3 ANSP members of FAB (DSNA, DFS, skyguide), 3 European airlines (Air France, SWISS, Lufthansa) and Airbus Prosky, Airbus' ATM subsidiary. Other partners have been associated: Hop*!,* Delta and Boeing. EUROCONTROL has also supported FAIRSTREAM live trials.

The objective of the FAIR STREAM project was to pave the way for the use of target time of arrival (TTA) instead of – or complementary to – calculated take-off time (CTOT).

ATC workload, the flight efficiency (time and fuel) and flight crew workload has been evaluated. When the traffic predictability was improved, the margins taken by Air Traffic Control (ATC) services to control the sectors workload is reduced, and the real ATC sectors capacity increased.

In total, 825 flights were analysed during the trial. The results & conclusions are as follows:

- In today's technical environment, the use of TTA is feasible and predictability has been improved;
- Variability is sensitive to the 2 following points:
  - Take-off: take-off time plays an essential role in the adherence to TTA. It was observed that departure time is subject to many factors that influence its predictability and thus TTA's variability;
  - Unplanned Direct routes. It was observed that for operational reasons, unplanned DCTs are necessary and could affect the TTA adherence;
- The FAIR STREAM trial shows an increase of the predictability of the flights at the TTA fix, with all the actors in the loop and current technical on-board equipment.



- The FAIR STREAM project was the winner in the « Best Demonstration Project » category of the SESAR Project Awards at the World ATM Congress in Madrid on 8 March 2016.

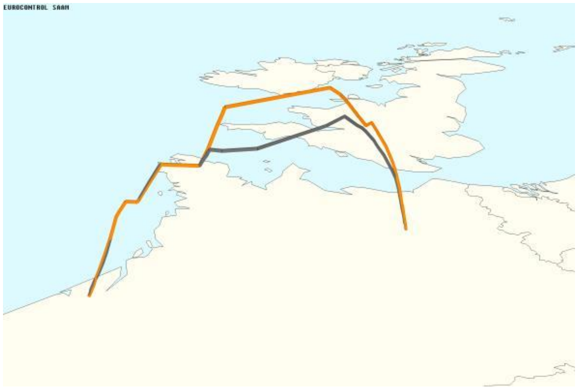
1.2.11 *Vertical Flight Efficiency Improvements for City Pairs*

Experts from air navigation service providers of FABs have investigated different ways to improve the vertical flight efficiency (VFE) of air traffic in European airspace. The investigation focused on the improved adaptation of vertical restrictions to seasonal and time-based procedures.

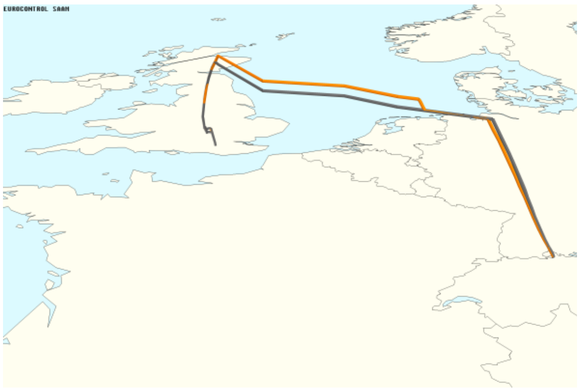
Examples are:

- FABEC: It resulted in the improvement of 30 city pairs where aircraft are granted a more optimal vertical flight profile. Depending on the individual city pair, aircraft can fly on a defined higher flight level or on the flight level they request. Implementations have been being phased in since 2015. The improvements are beneficial for the environment in terms of fuel burn and CO_2 emissions.

Example City Pair: Paris – Bordeaux



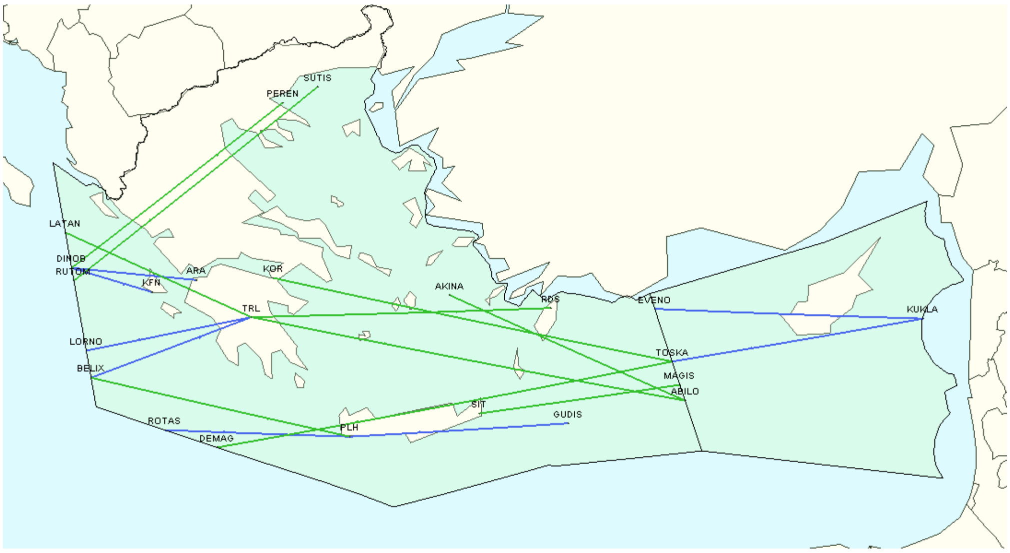
Example City Pair: Zurich – London



The expected performance contribution is as follows:

- Safety: 0
- Environment (Flight Efficiency): +
- Capacity: 0
- Cost efficiency: 0
- Military Mission effectiveness: 0

- BLUE MED: new DCTs implementation project in Greece and Cyprus is ongoing. This project is aiming at:
    - a gradual implementation of multiple DCTs connecting City Pairs among airports in the BLUE MED FAB airspace
    - paving the way to FRA implementation in Greece and Cyprus by 2022.



In the picture above, the already implemented DCTs are showed in green while those in blue will be implemented by 2018.

Furthermore, in all the FAB BLUE MED member States the optimization of ACCs' size and sectorisations as well as cross-border agreements were put in place to benefit the optimal flight trajectory. Moreover, new implementations of ARR/DEP procedures favour vertical Flight Efficiency using CCO/CDO techniques, as well as new P-RNAV and GNSS procedures.

The expected performance contribution is as follows:

- Safety: 0
- Environment (Flight Efficiency): +
- Capacity: +
- Cost efficiency: +
- Military Mission effectiveness: 0

- DANUBE FAB : provision of long distance direct routes (Long Range Directs) to airspace users in cooperation with the air navigation service providers of Serbia, Croatia, Bosnia and Herzegovina and Slovenia

1.2.12 AIM Synchronisation

It was ensured that a synchronisation is done for AIM publications for cross-border Airspace Design projects taking into account the national approval processes.

The aims of this initiative are:

- Determine present data inconsistencies and recommend or implement, respectively, corrections and mitigation;
- Establish a harmonized (common) FAB ATM Data Set available from the EAD (EAIMS) as the agreed common source for aeronautical information and provide sound proof that no inconsistencies exist. Deliverables are in detail:

▪ Catalogue of the aeronautical information subject to harmonization inside the FAB area.

▪ List of relevant aeronautical information presently not published in National AIP and recommendations for the handling/harmonization of such information.

- List of differences between the National AIPs, ENR-2 and ENR-3, and where required, recommendations for harmonization/alignment.
- List of (present) data inconsistencies and recommended or implemented, respectively, corrections/mitigation.
- Harmonized (common) FAB ATM Data Set available from the EAD (EAIMS) and thorough proof that no inconsistencies exist.

Examples are:

- FABEC: A Mandatory Information Area (MIA) was defined. It is an area in which all data changes from the Information Management perspective have to be coordinated with the concerned partners, to keep the level of data consistency and to avoid data inconsistencies. All FABEC ANSP AIM units with respect to aeronautical data requiring co-ordination or information exchange, respectively. The aim is to avoid data inconsistencies between National datasets and subsequently, publication of non-harmonized data.

1.2.13 ATFCM-ASM Project

The FAB Airspace Status Overview (FASO) system has been implemented. It provides a visual display of which military airspaces in FAB are needed at what times and thus not available to civil air traffic.

Description

The aim of the ATFCM/ASM project was to develop and implement **a FAB ASM function** addressing both civil and military airspace user's needs.

The FAB ASM function will rely on CDM only, AMC responsibilities remaining as they currently are, and should use interoperable tools and updated operational procedures to enhance data exchange/sharing and coordination between stakeholders. This project will contribute and follow the general initiative to establish common principles of ASM for FAB countries.

The FAAP project will achieve the following objectives in a stepped approach:

- Enable a FAB airspace overview
- Harmonize current ASM procedures
- Define CDM coordination procedures to provide ASM solutions

Step 1: Provide a FAB airspace overview and enhance the cooperation between AMCs:

- Benchmark ASM daily practices that are currently in place.
- Take into account the recommendations contained in the D7.1 document, aiming at establishing harmonized "Booking Principles and Priority Rules", and to use this as a basis for the establishment of harmonized procedures to enhance the current ASM, as presently contained in the current ASM Handbook
- Initiate a FAB wide coordination process between AMCs
- Introduce FAB wide data sharing to enable a FAB Airspace overview.

Step 2: Define CDM coordination procedures to provide ASM solutions**.**

- Take on board lessons learnt from step1.
- Establish processes of cross-border coordination to provide ASM solutions

Within the FAB framework, some trials to support the FAAP development have been performed partially with the participation of the airspace users.

The benefits are expected to be achieved during the implementation of step 2.

The expected performance contributions of step 2 are as follows:

- Capacity

A collaborative decision making process and cooperation between AMCs should result in an improvement due to better use of additional capacity provided through released airspace/CDR2. Airspace management based on Civil and Military needs.

- ENV/Flight Efficiency

Through better information sharing and improved planning, there will be more opportunities for CDR2 openings and tactical re-routings resulting in a possible reduction of fuel burn and reduction of gaseous and noise emissions.

- Cost Efficiency

Financial benefits expected for users through

- A better management of available capacity as well as a better network efficiency – notably with an increased rate of CDR2 use
- A balance to be found in Cost Efficiency between costs generation to man the function and a better management of airspace which reduces traffic complexity.

- Safety

An improved cooperation between AMCs and the operational use of shared ASM data cross-border should optimize the utilization of airspace which would reduce the number of hotspots, complexity, or workload to be processed by the controllers and in consequence reduce the risk of incident (indirect consequence from more capacity).

So, in summary, the expected performance contribution is as follows:

Safety:	+
Capacity:	++
ANS Cost Efficiency:	-
Flight Efficiency in Time:	+
Flight Efficiency in Fuel:	+
Flexibility / Interoperability:	+

Examples are:

- BALTIC FAB: the project was completed in 2016. Since in the event of threat to the national security ANSPs have to be able to ensure operations separately on very short notice, the common ASM support system is used in both ANSPs. The system is based on PANSA in-house product CAT and EUROCONTROL LARA, and it ensures promptly reaction to any airspace requirements, activating/deactivating or reallocating specific pre-tactical/tactical ASM scenarios, at the same time establishing and activating the most appropriate airspace configurations.

To replace the CHMI, EUROCONTROL launched a program called N-Connect which will combine both CHMI and NOP under web technology (web services to make available different type of data).

FMPs have high expectations. Tools supporting ATFCM activities are key elements to satisfy their "safety and performance" objectives but also to support some FAB's objectives (e.g. FRA, airspace projects). FAB FMPs working methods regarding air traffic management within the Core area need new applications. Those applications are not considered by EUROCONTROL, such as the detection of intruders, complexity management, the effect of weather and military activity on the tactical operational management of the capacity and traffic.

Some of the FAB ANSPs have already developed their ATFCM local tools. These tools are generally interfaced with other specific local tools. Other ANSPs have launched projects for developing their own tools.

The goal is:

- To capitalize on the knowledge of existing systems (functionalities)
- And/or to benchmark futures needs (operational requirements).
- Agree on OPS usage of the data.

The project will focus on common requirements and OPS usage for data exchange between FAB FMPs and between FAB FMPs and NM.

1.2.14 *EGNOS Approach Procedures*

FABs are striving to implement new GNSS IFR procedures to instrument approach runways to enhance the accessibility of the ADs, in line with ICAO PBN programme and the European PBN Implementing Rule with the aim to improve safety and cost efficiency.

Examples are:

- BLUE MED:

BLUEGNSS project (promoting EGNSS Operational Adoption in BLUE MED) is one of the H2020-Galileo-2015-1 projects selected for co-financing by GSA (the European GNSS Agency). The project started in January 2016 with a duration of 30 months. The primary objective of the BLUEGNSS Project is to harmonize the implementation of PBN approach operations among the BLUE MED FAB States by using EGNSS (European GNSS infrastructure such as EGNOS and in future Galileo). So far 11 GNSS approach procedures have been designed and validated by BLUEGNSS project (Mitilini-G, Ioannina-G, Thessalonikki-G, Kos-G, Larnaca-C, Paphos-C, Luqa-M, Cuneo-I, Parma-I, Bolzano-I, Lamezia Terme-I). Furthermore, thanks to the project, Greece and Malta have signed an EGNOS Working Agreement (EWA) with ESSP, the EGNOS service provider. Italy has already signed the EWA on 2012 and Cyprus has already started the process with ESSP.

1.2.15 *Cross-Centre Arrival Management*

Description

The Cross-Centre Arrival Management (XMAN) project is a multi-stakeholder project, conducted by ANSPs of the European core area (Belgocontrol, DFS, DSNA, MUAC, LVNL, skyguide, NATS and Austrocontrol) to ensure a harmonized and coordinated implementation of Extended Arrival management in accordance with PCP Implementing Rule 716/2014 and the Deployment Programme 2015 (DP2015) of the SESAR Deployment Manager.

The overall objective of the FAB XMAN Project is to develop, to validate and to implement cross centre and cross border arrival management procedures and techniques that enable an optimised traffic flow into the major airports within and close to the FAB airspace. As such, the project aims to generate a considerable improvement in various performance categories such as environment (CO2 and fuel-burn reduction), safety (reduction in stack holding) and capacity (reduction in traffic bunching/workload).

Started in 2012, it focused initially on the optimization of traffic flow inbound the five major hubs London, Paris, Amsterdam, Frankfurt and Munich. After publication of PCP IR 716/2014, the scope has been expanded to cover all PCP-related airports in the European Core Area (Area of Responsibility of the contributing ANSPs).

A common operational concept (CONOPS) and a standardised set of system requirements have been developed to produce harmonized procedures for concrete implementations down to system level and operations level.

As described in the PCP IR and DP2015 (family 1.1.2.), the XMAN project aims for the extension of the planning horizon of arrival management systems (AMAN) from the local TMA into the airspace of adjacent en-route control centers up to about 200 NM including economical Top of Descent (ToD) around the PCP-airports – or even beyond – depending on the operational environment and the needs of the stakeholders.

The XMAN project foresees a stepwise implementation, where the first (Basic) Step encompasses the upgrade of currently available systems and technologies in order to establish Extended Arrival management, e.g. through exchange of arrival management information via OLDI (AMA message) or SWIM-ready web services (XML format)). Arrival traffic flows into the major hubs in the FAB and UK/IRL area are optimized by extending the planning horizon of supporting AMAN tools up to 200 NM, involving - in consequence - various adjacent ATC units.

Airspace design is not affected by the XMAN project. Input data for the AMAN systems are FPL data (via IFPS), surveillance data (via RADNET - where available) and/or EFD data (via ETFMS).

The final objective of the FAB XMAN Project is to provide XMAN implementations for the airports Paris (CDG, ORY), Amsterdam, Frankfurt, Munich, London (LHR, LGW, STN), Zürich, Brussels, Düsseldorf, Berlin, Nice until 2023, in order to comply with the PCP implementation regulation for ATM Functionality #1 and the related SESAR Deployment Plan.

Current status

At this stage, the first step of XMAN (“XMAN Basic Step”) has already been implemented between London-Heathrow and UAC Maastricht, Reims ACC, Brest ACC, Munich ACC and UAC Karlsruhe. As for the latter the new XMAN functionality covers arrivals from the west. It is the second XMAN implementation for arrivals to Munich as an initial XMAN functionality with Vienna ACC has been in operation since 2010. The objective is to optimise arrival flows by managing the speed of aircraft already in the airspace of adjacent control centres.

Net Present Value[1]

NPV = € 238,253,979

Expected Performance Contribution

In general, it can be stated that extended arrival management absorbs delay in the en-route phase of a flight, when aircraft are cruising at higher altitudes. Hence, it is more efficient and saves fuel and CO2 compared to stack holding or long transitions in the TMA. This procedure also reduces noise for the communities living beneath the holding stacks.

[1] A comprehensive description of the Net Present Value is given in Annex 2.

The potential benefits of XMAN operations have been assessed with the currently available sources and methods:

- Experience and reports from existing XMAN implementations and/or related operational trials Reports from completed Fast Time simulations (FTS) or Real Time Simulations (RTS)
- Expert judgment and advice from involved actors.

The following statements indicate the performance potential per KPA.

- Capacity

Slight improvements may be possible for ANSPs, depending on the ATC environment. The XMAN utilization has to be described in more detail before the performance impact can be determined with more accuracy. All experts agree that there is an overall positive effect for Network Management.

- ENV/Flight Efficiency

Clear benefits on reduction on fuel burn, and reduction on gaseous and noise emissions are expected.

- Cost Efficiency

There is a negative effect on cost efficiency expected for ANSPs, since no direct return on investment can be assumed.

- Safety

Some improvements on safety, mainly through increased situational awareness and reduction of manoeuvring in/close to the TMA are expected, but due to the high safety level at present, no measurable impact on KPIs can be expected.

The project is planned for implementation under the framework of the SESAR Deployment Manager.

So, in summary, the expected performance contribution is as follows:

- Safety: +
- Capacity: +
- ANS Cost Efficiency: -
- Flight Efficiency in Time: +
- Flight Efficiency in Fuel: +
- Predictability: +
- Flexibility / Interoperability: +

1.2.16 Point Merge

Point Merge is a systemised method for sequencing arrival flows. Point Merge is one of the ICAO Aviation System Block Upgrades and is referenced as a technique to support continuous descent operations (doc 9931).

Today's situation with radar vectoring makes for a heavy controller workload, a great deal of radio communication, diminution of pilot situational awareness, difficulty in predicting and improving vertical profiles and large dispersion at low altitudes.

Point Merge is expected to provide benefits in terms of safety, environment (in approach sectors) and capacity (in terminal sectors), even with high traffic loads.

Depending on the operational and environmental constraints, and on the design choice made, these are the expected benefits:

- simplification of controller tasks, reduction of communications and workload;
- better pilot situational awareness;
- more orderly flows of traffic with a better view of arrival sequences;
- improved containment of flown trajectories after the merge point;
- better trajectory prediction, allowing for improved flight efficiency;
- standardisation of operations and better airspace management.

Source: EUROCONTROL, www.eurocontrol.int/services/point-merge-concept

Examples are:

FABEC: The initiative involves the centres of Paris, Belgocontrol, MUAC and BAC. It envisages to improve the flight management arrival to Paris CDG through:

- an easier management of sectors labelled “AP” and “TE”;
- an extended coordination between Paris ACC/UAC and Paris CDG APP;
- a better trajectory predictability for users;
- the improvement of vertical profile.

BLUE MED: ENAV has implemented RNAV1 “Trombone” procedures established at the airports of Rome Fiumicino, Verona, Olbia, Palermo and Bologna. The “Trombone” procedures allow all arriving aircraft to optimize the planning of the TOD (Top of Descent) and the ideal descent profile by following a path that reflects the operational flying techniques (Downwind and Base legs). Such procedures enable the optimization of the Flight Efficiency and ensure Airspace Users a high degree of predictability during the approach phase.

1.2.17 Weather-Induced Delay

The main goal is to look for possible solutions to minimise the impact of weather induced delay at FAB level without compromising safe operation. As a first step a benchmark was conducted in a structured way to find best practices in handling weather in ATC to be applicable for all civil FAB partners and the second step is to identify activities to be launched at FAB level. At the World-ATM Congress 2018 an Inter-FAB Panel was conducted to detect best-practises throughout Europe and to coordinate the activities in the different FABs along with weather and climate experts.

Even if this initiative is mainly targeting the safety, it may also contribute to capacity and flight efficiency improvements during adverse conditions.

So, in summary, the expected performance contribution is as follows:

- Safety: +
- Capacity: +
- Flight Efficiency in Time: +
- Flight Efficiency in Fuel: +
- Predictability: +
- Flexibility / Interoperability: +

1.2.18 *Over Deliveries/Intruders*

The objective of this initiative is to provide Flow Managers respectively NMOC and FAB FMPs with:

- An operational concept detailing the different types of proven or potential intruders along with use cases including impact assessment and the different solutions to handle deviations from the flight plan.
- Common specifications for tools to analyse in real-time 4D profiles and to highlight candidates whose current profiles are requesting action.

This initiative will mainly contribute to increase safety and capacity
So, in summary, the expected performance contribution is as follows:

- Safety: +
- Capacity: +
- Predictability: +
- Flexibility / Interoperability: +

1.2.19 *Optimising of Routes and Profiles*

The optimizing of routes and flight profiles together with airspace users is a constant issue as traffic flows change permanently. The FAB provides the correct fora to address these operational problems as flows involve mostly several ACCs and airspace users prefer to discuss once with all adequate ATM-Units with one ACC and the other.

Examples are:

FABEC: The initiative involves the centres of Karlsruhe, Langen, Munich, Bremen and MUAC Maastricht to achieve shorter routes and better profiles supported by AO input via joint working group (AG Optimiertes Fliegen), thus optimizing the interfaces between DFS ACC/UAC and neighbors.

1.2.20 *High-Profile Transition Operation*

This cooperation initiative intends to establish Continuous Descent Operations (CDO) with pre-programmed vertical guidance (e.g. STARs)..

Obviously, an improvement in terms of vertical flight efficiency is expected.

Examples are:

FABEC: Initiative between DFS, EUROCONTROL and MUAC into EDDF and EDDM from cruising level, including CCO operations with procedural spacing. It involves the ACCs of Langen, Karslruhe and Maastricht.

1.2.21 *Continuous Decent Operations*

The implementation of continuous descent approach techniques is a goal in the 'European Single Sky Implementation' Plan (ESSIP).

Continuous Descent Operations are known to reduce emissions, fuel use and noise and thus benefits airspace users, people living in the airport surroundings and the environment.

In summary, the performance picture looks as follows:

- Safety: 0

- Environment (Flight Efficiency): ++
- Capacity: 0
- Cost Efficiency: 0
- Military Mission Effectiveness: 0

Examples are:

FABEC: EDDF via EMPAX; EDDM via ELMOX and 10 other German airports; EBBR on the PRS runways and at the regional airports of Brussels-South (EBCI) and Liège (EBLG).

1.2.22 *Collaborative Advanced Planning Tool*

With this initiative a coordinated flight plan is built, on an iterative approach and in a collaborative way, by suggesting to the airline's operations options of trajectories avoiding congested control sectors.

A trial was conducted during April 2015 and it became operational on 7th of July 2015 and has proved its efficiency in terms of predictability, network stability, delay and fuel savings.

This collaborative process is supported by a web-based B2B enabler providing the following features:

- Real-time communication operations and first line actors collaboration between ACCs and airlines Operational Control Centers (OCCs);
- Sharing of real-time operational data (B2B application)
- Routing of information.

The CAP process strengthens common situation awareness on the network, stabilizing the European Aviation Network while providing concrete and tangible evidence of the benefits offered by *quick win* projects in day-to-day operations.

Examples are:

FABEC: Marseille ACC/UAC, Reims ACC/UAC and Paris ACC/UAC, Bordeaux ACC and Brest ACC first with flights from South France to London Heathrow and later on extension to catch new flows such as catching traffic from Spain Canarias, Baleares, to UK.

1.2.23 *Business continuity and Contingency*

This initiative aims at implementing procedures to provide Business Continuity for airports and airspaces during outage by using the infrastructure of partners.

The expected performance contribution can be assessed in the following way:

- Safety: +
- Environment (Flight Efficiency): +
- Capacity: 0
- Cost Efficiency: 0
- Military Mission Effectiveness: 0

Examples are:

FABEC: Business Continuity for Belgian regional airports during outage of EBBR ACC/APP. In particular, the following collaborations will support this business continuity project:

- For EBLG: EBLG APP and DFS Langen ACC;
- For EBCI: EBCI APP and DSNA LFQQ;
- For EBOS: EBOS APP and NATS London LTC/LAC.

Realisation of contingency facilities for ACC Langen at site of UAC Karlsruhe and realisation of contingency facilities for UAC Karlsruhe Langen at site of ACC Langen.

FAB CE: Coordinated contingency procedures and technical solutions – benefits are expected in emergency cases with a significant increase of contingency capacity. Work is continuing to find solutions for business continuity.

1.2.24 <u>Deploy AMAN - Arrival Management</u>

The deployment of a user friendly arrival manager supports controllers to optimise traffic flows to airports. The deployment is combined with initial steps to improve sequence stability by extending the AMAN horizon. The functionalities deployed are in accordance with the Pilot-Common-Project (EU No. 716/2014). The project implementation is under the framework of the SESAR Deployment Manager and coordinated at FAB level.

Examples are:

FABEC: The implementation of an arrival management system for Dusseldorf airport and Cologne airport and at Amsterdam Schiphol Airport.

The expected performance impact is as follows:

- Safety: N/A
- Capacity: +
- ANS Cost Efficiency: -
- Flight Efficiency in Time: +
- Flight Efficiency in Fuel: +
- Predictability: +
- Resilience: N/A
- Flexibility / Interoperability: +

BLUE MED: The implementation of an arrival management system for Rome TMA airports (Rome Fiumicino, Rome Ciampino by 2019) and Milano TMA airports (Milan Linate, Milan Malpensa, Bergamo by 2020).

AMAN will support “delay sharing” and the following functionalities:

- Extended Horizon (Pre-sequencing);
- Trombones RNAV Interoperability;
- Multi airport & multi runway;
- Runway balancing;
- Different STARs Strategies (i.e. “no crossing” or “minimum taxi”);
- Ground delay absorption for short-route flights.

The expected performance impact is as follows:

- Safety: N/A
- Capacity: +
- ANS Cost Efficiency: -
- Flight Efficiency in Time: +
- Flight Efficiency in Fuel: +
- Predictability: +
- Resilience: N/A
- Flexibility / Interoperability: +

1.2.25 Performance Based Navigation

Performance-based Navigation (PBN) is helping the global aviation community reduce aviation congestion, conserve fuel, protect the environment, reduce the impact of aircraft noise and maintain reliable, all-weather operations, even at the most challenging airports. It provides operators with greater flexibility and better operating returns while increasing the safety of regional and national airspace systems.

The impact on the different KPAs is expected to be as follows:

- Safety, +
- Environment, +
- Capacity +
- Cost efficiency +

Examples are:

FABEC: Luxembourg TMA

BLUE MED: the BLUEGNSS project has implemented 15 RNP approach procedures (with all 3 minima lines) in 10 airports (Mitilini-G, Ioannina-G, Thessalonikki-G, Kos-G, Larnaca-C, Paphos-C, Luqa-M, Cuneo-I, Parma-I, Lamezia Terme-I) and one RNP AR solution for Bolzano airport in Italy. The project has also trained procedures designers from Greece, Cyprus and Malta on PANS OPS.

Furthermore, PBN and GNSS procedures, increasingly gaining ground over BLUE MED FAB airports, reduce and optimize final approach procedures and the descent path for landing, thus optimizing the flight profile and consequently fuel consumption, emissions and noise near airports.

1.2.26 Colocation and/or Civil-Military Integration

Civil and military Airspace Users do compete on the same airspace. To fulfil the requirements of both parties is a main challenge for FABs. The coordination process between the civil and military side is supported by the colocation and/or civil-military Integration of the different providers.

As a result, more direct routing will be possible, (military) mission effectiveness can be guaranteed, ATC handling capacity will be increased and a positive effect will be effected concerning aviation safety. It promotes civil-military interoperability and cooperation, it is a prerequisite for the optimisation of the airspace design.

The expected performance contribution is as follows:

- Safety: +
- Capacity: +
- ANS Cost Efficiency: 0
- Flight Efficiency in Time: +
- Flight Efficiency in Fuel: +
- Predictability: +
- Flexibility / Interoperability: +

Examples are:

FABEC: Civil-military centre consolidation is achieved by the co-location of the Air Operations Control Station New Milligen (AOCS NM) of the Royal Netherlands Air Force Command (RNLAF) at the Amsterdam ACC Centre of the Netherlands of Air Traffic Control the Netherlands (ATC-NL).

MUAC OAT Service Provision project will implement OAT services in the Hannover UIR and Amsterdam FIR. Staff from DFS Lippe has been integrated into MUAC. The project is the fusion of the previous NLUM (Military ATS Provision in AMS FIR) and ILRM (Integration of Lippe Radar at MUAC) projects with revised timelines. The MOAT project is split into starter and optimisation phases.

BLUE MED: Air-to-Air Refueling (AAR) route project has been started. A new junction corridor between Italian e Maltese route network has been implemented. Some items related to the development of FAB's military route networks (one for RPAS and another for Air to Air Refueling activities) are in the pipeline.

1.2.27 <u>Workload model</u>

Development and implementation of a workload model, to predict controller workload. This initiative supports the implementation of the PCP.

The expected performance contribution is as follows:

- Safety: 0
- Capacity: +
- ANS Cost Efficiency: 0
- Flight Efficiency in Time: +
- Flight Efficiency in Fuel: +
- Predictability: +
- Flexibility / Interoperability: 0

Examples are:

FABEC: Amsterdam Area Control and Approach Control operations.

BLUE MED: Nicosia FIR (Cyprus) operations.

1.3 Safety – States side

1.3.1 NSA Cooperation

The FAB NSA Committee has developed methodologies and procedures that facilitate and harmonise the NSA work at FAB level. Furthermore, they implement article 2.3-6 of EC 550/2004, which requires that in case of FAB, cross-border and/or multi-State service provision, arrangements for proper supervision need to be made between the involved authorities.

1.3.2 Exchange of Safety auditors

The FAB NSA cooperation contains amongst other things, the first steps for the harmonisation of the national audit processes and the exchange of audit personnel within FABs.

1.3.3 Certification and monitoring of training organisations

The FAB State Treaty defines the needs for the supervision of the FAB. In regards the training organizations, the work to be done by the competent authorities refers to certification, approvals and monitoring. The applicable regulation for the supervision of the FAB is regulation (EU) No 805/2011 laying down detailed rules for air traffic controllers' licences and certain certificates pursuant to Regulation (EC) 216/2008 of the European Parliament and of the Council. In order to be in line with the Treaty, a Training Task Force was created to deal with the supervision of initial training for ATCOs. It tackles the certification and monitoring of training organisations and approval of training plans, the approved part is known as FAB training course and mutual recognition of student licenses.

1.3.4 Effectiveness of Safety Management within a FAB

A procedure for a common/joint approach of the verification of the EoSM ANSPs has resulted in an additional harmonised approach in the Key Performance Area of Safety.

1.4 Safety – ANSP side

1.4.1 Audits at Partner ANSPs

ANSPs share staff to conduct audits at the partner organizations. This has several advantages, such as an exchange of best practises, the sharing of staff and the alignment of different cultures.

Examples are:

FABEC: IntACT is an international audit cooperation team, composed of representatives from ANA Lux, Belgocontrol, DFS, DSNA, MUAC/EUROCONTROL and skyguide. The IntACT team is auditing all areas of air navigation services: the operational units, the technical branches, all supporting processes and the safety management system itself. The safety management systems of DSNA, DFS, MUAC and skyguide were audited by an IntACT team completely independent from the audited organisation. The IntACT team conducted 58 audits in the first reference period (2012-14), including the inspection of technical infrastructure at Belgocontrol. Ever since the annual audits are around this figure. Additionally, on a trial basis, DFS performed a Local Safety Survey – workshops with operations personnel – at one of its tower units within the framework of IntACT.

DANUBE FAB: common audit activities between Bulgarian and Romanian CAAs

1.4.2 *Cooperative Safety Nets*

This initiative aims at providing safety alerts to ATCOs.

Examples are:

FABEC: DSNA with MSAW (Minimum Safe Altitude Warning), STCA (Short Term Conflict Alert), APW (Warning Area proximity), as well as other useful information: MAP (activation of dynamic maps on IRMA screens), DADA and (Automatic Detection of landings and take-offs).

1.4.3 *Sharing of best practices in Just Culture*

The purpose is to share best practices to come to an optimal FAB Just Culture situation or climate.

Examples are:

BLUE MED: BLUE MED FAB Just Culture Declaration

1.4.4 Jointly Occurrences Investigations, Analysis and Follow-up at FAB Level

ANSPs Safety Experts, using a virtual BM FAB AoR defined in eTOKAI reporting tool, can share the "cross boarder" occurrence reported. This process has several advantages: easy exchange of findings, sharing of common mitigations, definition of common best practises, sharing and alignment of different occurrence investigation approach.

Examples are:

BLUE MED: ENAV/MATS cross boarder occurrence analysis.

1.4.5 *Safety Cooperation for Operational improvements & for R&D Activities*

This initiative aims to share safety expertise to facilitate the common use of safety tools (eTOKAI, RAT, etc.) and/or to align the safety evaluation activities to be applied to the new ATM concepts (free route, remote/digital tower, PBN, etc.).

Examples are:

BLUE MED: eTOKAI implementation programme, Blue GNSS project, Free Route implementation, etc.

1.4.6 *Search and Rescue (SAR) service coordination*

Objective of this project is to optimise SAR Coordination service provision between Civil and Military authorities and ensure contingency service provision.

Examples are:

BALTIC FAB

1.5 Technology

The States have committed to their FAB State Treaty and the convergence of ATM systems and the cost-effective deployment of technical infrastructure and services.

The main objectives in the technology domain are to:

- coordinate and synchronise FAB activities within the scope of SESAR (both R&D and Deployment)
- provide technical support for FAB projects
- explore technical concepts which foster convergence, consolidation and defragmentation and support synchronized implementation when approved

Furthermore, FAB members focus on SESAR and ensures an effective FAB coordination and timely common FAB positioning, while maintaining an oversight of SESAR matters at FAB level.

1.5.1 Common VCS specifications

At FAB level Common VCS specifications have been defined and have been used or will be used for any future Call for Tender (CFT) within the FAB. These specifications are continuously updated according to new requirements.

The benefits are:

- Improved interoperability between FAB ANSPs paving the way for the implementation of a cross-border dynamic sectorisation concept;
- Saving on investment cost: the use of common specifications for the different CFTs within FAB allows reducing the development cost;
- Availability of new generation of VCS, compliant with new and cheaper technologies (such as Voice over IP communications) and with European safety regulation.

Small ANSPs can benefit from common procurements because of economies of scale.

Examples are:

FABEC: MUAC, DSNA and DFS

1.5.2 Common safety nets

Within FABs a benchmarking has been conducted to detect which ANSP has which Safety Net Components in use and at which stage an ANSP will need to upgrade one of these components.

The benefits are:

- Saving on development cost;
- Paving the way for future common development.

Examples are:

FABEC: DFS integrated in their CWP the DSNA safety nets.

1.5.3 *OLDI coordination*

A Task Force developed a plan to maximise benefits from using the existing OLDI mechanism. The result is a harmonization of the application, system parameters and procedures for OLDI messages, especially LAT LON, REV, MAC.

Additional use of OLDI messages is being implemented in a coordinated way.

Examples are:

FABEC: As an enabler for the FABEC FRA project.

BLUE MED: a yearly report on the OLDI messages already implemented, as well as the yearly plans for the new OLDI messages deployments, are available for BLUE MED FAB Members.

DANUBE FAB partners are currently working on full OLDI implementation

1.5.4 *Improving interoperability through OLDI & IOP*

A FAB coordination body coordinates the introduction of additional OLDI messages.

The FRA implementation based on IOP as defined in AF5 is not yet fully mature. Therefore, in a first step tactical exchange of flight plan information and automated coordination is supported by the use of OLDI messages. The FAB partners are cooperating through SESAR IOP decision & analysis teams to mature the interoperability through IOP and participate in EUROCAE WG59 to set up the new IOP standard ED133 rev A.

The benefits are:

- Sharing experience and validation exercises.
- Initial FRA implementation with the use of OLDI messages.
- Sharing FAB findings with neighbouring FABs and promoting interoperability Europe wide
- Ensure interoperability of iTEC and Coflight systems to improve common awareness and trajectory sharing, to facilitate cross-border FRA and to comply with SESAR PCP.

Examples are:

Inter-FAB: UK/IR FAB, FAB CE, Baltic FAB, BLUE MED and FABEC

1.5.5 *Deployment of next Generation and VoIP Capable Centre Voice Communication Systems*

Deployment of a new state-of-the-art Voice-over-IP capable Voice Communication System as a technical prerequisite in line with the Interoperability IR (EU No. 552/2004 incl. its amendment by EU No. 1070/2009) for the implementation of dynamic airspace configurations (technical enabler).

Examples are:

FABEC: Langen and Munich

DANUBE FAB: common VC system procurement and implementation in Sofia and Bucharest FIRs

1.5.6 *ATS Last Resort System*

Upgrade of ATM Fallback and Contingency System (Contingency facility) as a result of the technical cooperation at FAB level, harmonisation of working principles and adaptation, leading to an increase in the network capacity in case of Fallback/Contingency, an increased robustness and sustainability in the ATM system.

Examples are:

FABEC: DFS-LVNL

BALTIC FAB: iTEC/Convergence of ATM systems in the Baltic FAB ACCs and Cross Borders Service provision with Joint Contingency Service Provision. Ongoing activity.

1.5.7 *Aeronautical Message Handling System (AMHS)*

Modernisation of data communication and the Network Manager (Basic AMHS service). This initiative allows the Replacement of obsolescent technology and to support future messaging requirements (ESSIP-COM10).

Examples are:

FABEC: Amsterdam Schiphol with adjacent COM-centres

1.5.8 *Implementation of Aeronautical Data Quality*

With the EU No. 73/2010 the European Commission has set obligatory specifications for dealing with aeronautical data and aeronautical information in Europe. Without obligation for AIXM5.1, there is only one economic way for realizing the specifications defined in Chapter II article 4 (Data Set) and article 5 (Data Exchange). It is the intensive use of AIXM5.1. In consultation with the responsible authorities, therefore national aeronautical data suppliers and the ANSP migrate their relevant IT systems to AIXM5.1.

With completion of the project, one will be able:

- receiving in conformity with EU No. 73/2010 aeronautical data in AIXM5.1 format,
- exchange data between internally databases in AIXM5.1 format and also

  providing external entities with aeronautical data in the AIXM5.1 format.

It will support the implementation of the Pilot-Common-Project (PCP), promotes safety and interoperability.

Project is implemented under the framework of the SESAR Deployment Manager.

It will support the implementation of the Pilot-Common-Project (PCP). The expected performance picture looks as follows:

- Safety: +
- Capacity: 0
- ANS Cost Efficiency: 0
- Flight Efficiency in Time: 0
- Flight Efficiency in Fuel: 0
- Predictability: 0
- Flexibility / Interoperability: +

Examples are:

FABEC: DFS / Germany.

BLUE MED:

Aeronautical Data Quality has been derived from Regulation (EU) No 73/2010 of 26 January 2010 laying down requirements on the quality of aeronautical data and aeronautical information for the single European sky (Official Journal L23/6, dated 27.01.2010). The Regulation lays down the requirements on the quality of aeronautical data and aeronautical information in terms of accuracy, resolution and integrity [Article 1].

It applies to European Air Traffic Management Network (EATM Network) systems, their constituents and associated procedures involved in the origination, production, storage, handling, processing, transfer and distribution of aeronautical data and aeronautical information [Article 2(1)].

The Regulation applies to the following aeronautical data and aeronautical information [Article 2(1)]:

- the integrated aeronautical information package (IAIP) made available by Member States, with the exception of aeronautical information circulars;
- electronic obstacle and electronic terrain data or elements thereof, where made available by Member States;
- aerodrome mapping data, where made available by Member States.

It applies to ANSPs, AIS Providers, operators of those aerodromes and heliports for which IFR or Special-VFR procedures have been published in national aeronautical information publications, public or private entities providing services for the origination and provision of survey data, procedure design services, electronic terrain data, electronic obstacle data and manufacturing industry [Article 2(2)].

It applies up to the moment when the aeronautical data and/or aeronautical information are made available by the aeronautical information service to the next intended user [Article 2(3)].

With regard to the above, the BLUE MED FAB Member States have decided to cooperate in order to implement the provisions contained within the regulatory framework in a harmonised manner.

The main actions foreseen for EC Reg 73/2010 (ADQ) implementation are constantly monitored by the ADQ Implementation Roadmap Scheme that can be used both to gain a quick recapitulation of the implementation status and as a planning aid.

BALTIC FAB:

The ‘Coordinated AIS provision within Baltic FAB’ project, closed in 2017, aimed at the optimization of AIS provision in the Baltic FAB including AIS data sharing and integrity and unification of used AIS systems which will allow ensuring contingency of AIS provision within the Baltic FAB.

Stripless / Paperless Systems

It will support the implementation of the PCP, a flexibility gain in allocating functions to working positions and extending the amount of working positions promote improvement of capacity. It enables new functionality required by PCP in a harmonized environment leading to an increase in safety and capacity through advanced ATC tools.

In regards to performance,

SAF +: The documentation of given clearances is improved with PSS. Even in ambitious traffic situations all details of a clearance are recorded. An accurate analysis of safety relevant incidents is possible which leads to an improvement of the safety level.

CEF +: Positive impact on unit costs and productivity by:

- Optimized staff deployment for the execution of air traffic control in ACC of lower airspace because of the shortfall of manual distribution of paper strips an certain system inputs
- Increase of capacity (= increase in sales) by system support

The benefit of the project exceeds the costs but it will take place after some years of project term.

CAP ++: Reduction of coordination workload by automation of coordination task respectively the forwarding of information. Thereby a reduction of manual coordination takes place. More movements and less delay in critical sectors at peak periods.

In summary:

- Safety: +
-
- Capacity: ++
- ANS Cost Efficiency: +
- Flight Efficiency in Time: N/A
- Flight Efficiency in Fuel: N/A
- Predictability: N/A
- Resilience: N/A
- Flexibility / Interoperability: N/A

Examples are:

FABEC: Geneva and Zurich ACCs, DSNA and DFS ACCs and UACs and Schiphol TWR

BLUE MED: ENAV has implemented a stripless/paperless environment since 1999 at all ACCs and is planning to introduce a similar environment at airport domain in the near future.

1.5.9 Surveillance coverage

In the FAB context the Wide Area Multilateration system (WAM) and Aircraft Derived Surveillance – Broadcast (ADS-B).

It will lead to an increased safety, while the expected impact on other performance domains is expected to be neutral:

- Safety: +
- Capacity: 0
- ANS Cost Efficiency: 0
- Flight Efficiency in Time: 0
- Flight Efficiency in Fuel: 0
- Predictability: 0
- Flexibility / Interoperability: 0

Examples are:

FABEC: North Sea Area Amsterdam

BLUE MED: a coordinated Maintenance Plan for the surveillance sensors is delivered twice a year.

The main objective of the Maintenance Plan is to inform the BLUE MED partners for the updates of the maintenance plan for the surveillance sensors operating in the BLUE MED area, which provide surveillance data to more than one country. The benefits deriving from this Maintenance Plan are very important, since they will enhance quality, reliability and safety of the surveillance picture provided to the ATCOs from the legacy systems of each country.

The Maintenance Plan is another step towards the enhancement of the quality, reliability and safety of the surveillance function in the BLUE MED area.

BALTIC FAB: Ongoing daily activities aiming at the optimization of CNS service provision through a better usage of the current resources, common planning and maintenance.

1.5.10 Common Use of Simulation Tools

FABs have used and are using for the fast-time simulations for the operational planning of processes in a common and sometimes even remote environment. Due to the use of "what-if" analysis and an automated results output, a number of questions with regard to operational planning of processes can be efficiently answered in future: best model of sectorisation for daily traffic situation, more flexible civil-military airspace utilization, determination of sector capacity values, use of reroutings, etc.).

The forecast data currently provided by NMOC do no longer comply with the requirements of modern ATC management in terms of quality and functionality because they only present quantity structures but do not consider the complexity of air traffic. The planning and control of sectors to be staffed in the course of a day will improve which will ensure demand-oriented and efficient staff scheduling. At the same time, the capacities required for the expeditious handling of air traffic will be available for airlines. In its initial phase, the new common tool will be used as a supplementary system to the NMOC system. In the medium term, it is planned that only air traffic flow management measures will be generated and managed via the interface to the NMOC.

The following processes are supported by the system:

- Selection of the most efficient sectorisation on the basis of the traffic forecast
- Tactical measures to handle short-term traffic peaks more efficiently
- Air traffic flow management on the basis of traffic forecasts
- Determination of realistic sector capacity values on the basis of a long-term analysis of the traffic figures (CAPAN function, planned functionality)
- Verification of rerouting options (planned functionality)

Examples are:

FABEC: DFS with Air Magic

BLUE MED: ENAV with Air Top and Network Strategic Tool (NEST)

BALTIC FAB: PANSA/Oro Navigacija with Local Traffic Complexity Management

1.5.11 *Deployment of Air Traffic Control System*

The deployment of a new Air Traffic Control System is envisaged to improve performance of KPAs Safety, Cost-Efficiency, Capacity and Environment by advanced controller support tools, easing problem solving, better conformance monitoring and easier standard handling of flights which leads to less workload per flight and more capacity, increased safety and improved cost-efficiency by higher productivity. More efficient problem solving and coordination will improve flight efficiency.

The combined effects are / will be leading to the following qualitative performance assessment:

- Safety: +
- Capacity: ++
- ANS Cost Efficiency: ++
- Flight Efficiency in Time: +
- Flight Efficiency in Fuel: +
- Predictability: ++
- Resilience: +
- Flexibility / Interoperability: ++

Examples are:

FABEC: DFS with the joint DFS/LVNL iCAS Programme which foresees the joint and common implementation of a new ATS system for all DFS and LVNL control centres. See also iCAS II.

BLUE MED: ENAV is working together with DSNA on the deployment of the 4-Flight Programmes which foresee the implementation of an ATM system jointly based on Coflight FDP and HANSP (Hellenic ANSP) is working on ATM system upgrade.

BALTIC FAB: PANSA and Oro Navigacija are performing activities to optimise ATM infrastructure in the Baltic FAB through a better usage of the current resources, common planning and maintenance.

1.5.12 *European MET Information Exchange*

Multi-Stakeholder initiative to establish a single source to request and receive customised MET information tailored for user's needs by applying smart functionalities

It provides a point of contact for requesting MET information services, using protocols and governance compatible with SWIM architecture and principles.

It will enable all stakeholders (ATC, Airlines, Airports, supporting actors) to base decisions on a common representation of meteorological situations.

The expected impact on performance is as follows:

- Safety: ++
- Capacity: ++
- ANS Cost Efficiency: +
- Flight Efficiency in Time: ++
- Flight Efficiency in Fuel: ++
- Predictability: ++

- Resilience: ++
- Flexibility / Interoperability: +

The project is planned for implementation under the framework of the SESAR Deployment Manager.

1.5.13 *Optimization of MET service provision models*

The optimization of MET (and contingency) service provision models among ANSPs ensures efficiency saving costs through economies of scale and supports the possibility to maintain high level of safety with a maintain in capacity due to right tactical decisions taken on time..

Examples: BALTIC FAB.

Hardware Upgrade

Hardware upgrades can be various: such as the controller screens, the automation system servers, workstations or the automation system network components. Due to the life cycle of hardware the upgrade offers usually a better resilience at a more competitive prices.

The expected impact on performance is as follows:

- Safety: 0
- Capacity: 0
- ANS Cost Efficiency: +
- Flight Efficiency in Time: 0
- Flight Efficiency in Fuel: 0
- Predictability: 0
- Resilience: +
- Flexibility / Interoperability: 0

Examples are:

FABEC: Belgocontrol hardware replacement of the CANAC2 Automation System (Eurocat) at all Belgocontrol units

1.5.14 *EAD AIM System Integration*

The migration to the central EAD-system can be performed by the usage of standard-EAD-terminal-clients and EAD-standard-interfaces. This supports FT 5.3.1 AIS System Upgrade to support AIXM 5.1. The project is implemented under the framework of the SESAR Deployment Manager. It prevents duplication in the development of software and promotes the usage of COTS products as well as reduces training costs by using EAD training.

The expected impact on performance is as follows:

- Safety: 0
- Capacity: 0
- ANS Cost Efficiency: +
- Flight Efficiency in Time: 0

- Flight Efficiency in Fuel: 0
- Predictability: 0
- Resilience: 0
- Flexibility / Interoperability: 0

Examples are:

FABEC: DFS EAD Migration.

BLUE MED: DCAC (Cyprus), ENAV (Italy) and MATS (Malta) migrated, HANSP (Greece) signed the EAD Agreement and currently the Migration Plan is under development.

1.5.15 Replacement and modernization of ILS

The main objective is to further harmonize technical specifications of air navigation systems within Europe and to operate these systems more cost-efficiently. By increasing the number of systems to be purchased, discount rates from system manufacturers are being expected, which will result in lower annual depreciation cost after start of operation.

Examples are:

FABEC: Cooperation initiative between DFS, LVNL, ANA Luxembourg. The project is being implemented as a common FAB procurement project with 3 ANSPs as equal partners.

1.5.16 Remote Tower Control

Many small airports face discontinuation of air transport service due low traffic volumes making the provision of service at these airports financially nonviable. Partly, this is due to high cost of the air traffic services provision. In order to retain air transport service at these smaller airports, solutions need to be deployed in order to ensure sustainable service provision.

Remote Tower Control (RTC) provides cost efficient air traffic services for airports from a remote i.e. third location. RTC achieves this through visual reproduction (based on high-definition video cameras, infrared cameras and panoramic high-resolution screens) replacing the on-site out of-the-window-view by an air traffic controller and allows remote air traffic service provision. Bundling air traffic services at an RTC Center allows for efficient staff resource deployment, which is enabled through a uniform concept of operations and qualifications. Furthermore, staff resources may be deployed optimized across the actual traffic demand at all three airports combined.

This project aims at enhancing ATM by implementing SESAR, as defined in the European ATM Master Plan (2015) in the Key Feature “High performing Airports”, there referring to “Remote Tower”.

In terms of performance, a positive impact on Cost Efficiency is expected.

Examples are:

FABEC: DFS with remote service for three smaller airports (Saarbrücken, Erfurt and Dresden to be controlled from Leipzig RTC centre)

1.5.17 *Modernization of Radar and surveillance Sensor systems*

The project is aiming to

1. Rationalize the surveillance infrastructure by fully decommissioning spectral inefficient and functionally inferior Mode A/C radars.
2. Deploy a full network of Mode S radars as required.
3. Deploy new surveillance sensors and senor mix as developed in the EU's SESAR Joint Undertaking program such as Multilateration and ADS-B complemented by a new network of Mode S radars. In addition, implement Multi-Static-Primary-Surveillance-Radars, as this technology becomes mature in the EU's SESAR Joint Undertaking's SESAR 2020 Program by the mid 2020's.
4. Deploy new radar data processing systems in an effort to integrate new surveillance sensors into a modular system.
5. Deploy civil/military use of radars in an effort to reduce cost by utilizing infrastructure synergies.

By means of this project the following benefits are achieved:

1. Increased reduction of separation minima from 5 to 3 miles increasing airspace capacity.
2. Cost-efficient operation of the new surveillance infrastructure through standardized units as well as civil/military radar sharing.
3. Usage of enhanced surveillance data increasing surveillance quality and accuracy; thus, increasing safety.
4. Implementation of new surveillance sensors with extended range resulting in a lower number of systems.
5. Reduction of high frequency radio fields increasing spectrum efficiency.
6. Deploy new and more robust systems against signal disturbing sources and enabling a reduction in protection zones also making attractive sites available for wind farm development.

The expected impact on performance is as follows:

- Safety: +
- Capacity: +
- ANS Cost Efficiency: -
- Flight Efficiency in Time: +
- Flight Efficiency in Fuel: +
- Predictability: +
- Resilience: +
- Flexibility / Interoperability: +

Examples are:

FABEC: DFS

BLUE MED: ENAV

1.5.18 Sectorless ATM

This initiative aims at the implementation of sectorless air traffic control in a first phase. In a sectorless air traffic management concept the airspace is not divided into sectors but seen as one piece. An air traffic controller is no longer in charge of a sector but is responsible for individual flights which he or she controls from the entry into the airspace to the exit. This means that the controller has to keep track of several flights and traffic situations which might not be in the same geographic region. Of course, such a considerable change of concept influences the tasks and way of working for the controller.

Sectorless ATM is expected to improve SAF, CEF, CAP and ENV: By allocating aircraft entering the sectorless airspace to air traffic controllers with unused capacity, overload situation are prevented, productivity is increased, and delay is reduced – while flight efficiency is improved by optimised coordination.

Examples are:

FABEC: DFS at UAC Karlsruhe

1.5.19 GNSS Monitoring

The global navigation satellite system (GNSS) is an essential enabler of the PBN concept.

Today some States face regulatory and institutional hurdles on the acceptance and use of current and future GNSS elements over which they do not have direct control. Performance assessments and notification of events that may affect the service would facilitate the State acceptance of GNSS elements by making available information that would assist their decision-making process.

The BLUEGNSS project has implemented a regional GNSS Monitoring Network, fully compliant with the last guidelines developed by ICAO on the GNSS Manual (Doc9849). The network is composed of a mix of dedicated stations and public data such as IGS or EDAS. The Central Monitoring Facility is installed in Ciampino and produce regular reports on GNSS performance and interferences available on the BLUE MED website.

1.6 Finance and Performance – States side

1.6.1 Financial Framework Study

Some FABs have identified the need to study the possibility to establish common financial framework to support the activities.

Example:

FABEC: It was investigated the possibility of a coherent and stable financial framework taking into account the charging objectives of the FAB Treaty and the pertinent Single European Sky charging and performance regulations. Such studies have been performed with internal expertise and with support of external experts.

1.6.2 Performance Plan - Performance monitoring.

RP2 Performance preparation whereby the FAB group responsible for Performance has submitted the FAB performance plan for the second reference period, including all the KPAs, signed by the members of the FAB Council and after organizing a Stakeholder Consultation Meeting. The FAB group responsible for Performance is acting as the point of contact for questions, requests for information and clarification during PRBs' assessment and for possible follow up actions related to notifications. If necessary, FAB group responsible for Performance will also coordinate the FAB position to be defined in order to be expressed at SSC level of the FAB States.

The FAB group responsible for Performance is monitoring the implementation of the FAB performance plan for the second reference period. This will be done in the same way as in RP1. The main difference could be that the FAB annual report may include the performance on all KPIs, be it at FAB level, for instance on en route capacity and safety, or at national level, for instance on terminal capacity and cost efficiency.

1.6.3 Performance case related to ANSP initiatives

The FAB group responsible for Performance will assess the Performance Cases developed for each ANSP performance initiative and submitted for approval. This group is also involved in all arising economic and financial issues of amongst others Airspace Design projects.

1.6.4 Inter-FAB Coordination

In order to explore how Inter-FAB coordination could be further developed, FABEC offered to organise with the idea of assessing and discussing the potential of Inter-FAB cooperation / coordination the Dutch presidency of FAB in 2014 a first workshop that brought together State representatives of all nine Functional Airspace Blocks (FABs) in Amsterdam on 18 and 19 November 2014. The workshop created an informal platform to exchange FAB-related information, to share various successful approaches and gained experiences. A second Inter-FAB workshop was organised by DANUBE FAB in 2015. In view of its preparation the Swiss Presidency organised a working meeting in Zurich in March 2015. The conclusion of the Zurich meeting showed amongst other things, support for a yearly event (meeting, workshop) of the FABs on Inter-FAB coordination, a preliminary identification of common fields of interest, the need for a structure to prepare the yearly event and for this purpose the set-up of a coordination group of 9 Point of Contacts (PoCs) as platform to manage the coordination and exchange information.

1.7 Finance and Performance – ANSP side

1.7.1 Common Procurement

FAB is a cooperation framework established by a States Treaty. As such it is not a 'legal entity' who could enter into contracts. Therefore, FAB cannot procure any goods or services by itself. It needs one of its members to do this on its behalf or a specific legal entity (e.g. joint venture).

Common procurements either allow to increase the efficiency of the FAB work or create economies of scale.

Examples are:

FABEC: Belgocontrol has been designated to perform the role serving as the legal entity for procurements. This means that common FAB procurements are done by Belgocontrol, applying

Belgian legislation. A system of reinvoicing allows the other ANSPs to contribute their share of the funding. A Belgocontrol staff member coordinates every procurement with the requesting FAB body on one side and with the Belgocontrol procurement department on the other side. With the establishment of a central management office (PMO in 2008, AFG since 2009), FAB started doing common procurements. This ranges from contracting external companies to provide specific expertise to FAB to procuring big simulating exercises at the EUROCONTROL Experimental Centre in Brétigny (France).

One of the first important initiatives in the latter context was the establishment of FAB-wide common Voice Communication Systems specifications, thus enabling common procurements of VCS.

DANUBE FAB: Common procurements of VCS, studies, website development and maintenance.

FAB CE: Common smart procurement with estimated cost savings of 15%. After successful trial a common procurement is planned every six months. A first larger on in mid-2019 with a volume of EUR 1 Mio.

1.7.2 A Performance Case Methodology

It describes the methodology to assess the performance contribution of individual FAB projects, taking into account the FAB performance targets.

1.7.3 Performance Reporting and Monitoring

The activity is to issue regular reports on the FAB performance in all Key Performance Areas (Capacity, Environment, Cost Efficiency and Safety) by comparing actual results to the performance targets defined by the Regulation. The reports get adapted regularly to meet changing requirements (e.g. derived from RP2).

Examples are:

BLUE MED

1.7.4 Finance reporting

Regular reports on the financial situation of individual ANSPs and if applicable on FAB level are made, answering needs from the Regulation. The common financial ANSP data is used to answer the different stakeholders' needs for information.

1.7.5 Capacity Planning

The Capacity Planning Task Force is formulating a Common Capacity Planning and delivering important contributions to the Performance Management.

1.7.6 FAB Customer Satisfaction Survey including the development/execution of an action plan

In regular intervals a FAB Customer Survey is organised. This survey is using different means of communication (phone, webpage, templates) to analyse customers' satisfaction with and in FAB. According to the results of the survey, an Action Plan to start the necessary means of reaction and to improve the situation is elaborated.

Examples are:

BLUE MED

FABEC: every two years via a web-based tool, structured telephone interviews and meetings with main customers

1.7.7 *Regular consultation sessions*

Depending on the status of projects, legal requirements and/or operational needs, communication or consultations are organised.
A special focus is on communication on operational topics such as development of communication plans of operational projects and execution of related activities.
The regular coordination with the States and the Social Dialogue is maintained.

Examples are:

BLUE MED

1.7.8 *Best practice sharing among FAB stakeholders*

The objective of best practice sharing among the FAB stakeholders is to achieve long term savings in area of non-operational staff and non-staff operating costs, including provision of certain services (i.e. calibration flights).

Examples are:

BALTIC FAB

1.7.9 *Cross-border arrangements between ANSPs in the frame of Art. 10 Regulation (EC) No. 550/2004*

Where ANSPs decide to avail themselves of the services of other service providers that have been certified in the Community, ANSPs must formalize their working relationships by means of written arrangements or equivalent legal arrangements, setting out the specific duties and functions assumed by each provider (*cf.* art. 10.1 and 10.2 SPR).

The purpose of Art. 10 SPR and in particular 10.3 SPR is to allow more flexibility in optimizing ANS provision. The agreements concluded on this basis provide a sound legal basis for cross-border airspace, as an umbrella agreement for operational Letters of Agreement (LoAs), where previously delegation of ATS (under ICAO Annex 11) was the chosen means but rarely legally achieved. In the FAB context each service provider was designated by its state for its national airspace or parts thereof. Therefore, such agreements will be needed between the ATSPs within FAB or between an ATSP of FAB and a non-FAB one. In order to achieve a harmonized approach for the FAB situation, a multilateral agreement was signed, covering all rights and obligations between the ANSPs. This multilateral agreement is amended by bilateral annexes, which address the specific cross-border situation between the parties.

These agreements provide for:

- The specific responsibilities, rights and obligations of the current ATSPs concerned while mentioning the services concerned;
- The geographical scope defined by the exact lateral and vertical limits set out in the LoAs;
- The obligation to comply with the rules and regulations applicable in the state of the delegating provider;
- The application of the operations manual of the effective service provider;
- The obligation of the effective service provider to comply with all relevant supervisory measures issued by the competent NSA;
- The obligation of occurrence reporting by the effective service provider to be transmitted to the commissioning provider;

- The commitment of the effective service provider to cooperate in cases of aircraft accidents and serious incidents;
- Reciprocal obligations to notify the other party about any changes which may affect the provision of services;
- The allocation of liability and adequate insurance coverage.
- The possibility to include financial arrangements;
- Contingency procedures to be applied in the cross-border area.

These agreements, which were approved by the FAB Member States, are enabling cross-border services regardless of national boundaries and gain more flexibility in service provision.

Examples are:

FABEC: All ANSPs.

BLUE MED: ENAV and MATS

DANUBE FAB: Romania and the Republic of Bulgaria

BALTIC FAB: All ANSPs

1.7.10 Joint international representation

The FAB has taken over some representation of ANSPs in different bodies either for SESAR, EUROCONTROL working groups, INEA financing or Social Dialogue.

Examples are:

FABEC: all ANSPs

FAB CE: all ANSPs. The benefits have been quantified by comparing the travel costs ex ante and ex post and they are in the magnitude of EUR 80.000 p.a. for FAB CE alone

1.8 Human Resources

1.8.1 Basic Training Course

A FAB-wide standard for a basic OPS training course was developed. An agreement was signed covering the joint provision of air traffic controller basic training, the coordination of training needs and the capacity to provide basic training courses.

Examples are:

FABEC: DSNA, ANA, DFS, MUAC, Skyguide, LVNL

1.8.2 QUASAR

The QUASAR (QUestionnaire for ATSEP Standard Assessment Routines) initiative, working as the QUASAR Task Force (QTF) is behind the initial idea launched by FABCE partners ANS Czech Republic, Austro Control, BHANSA, CANI, Croatia Control, Hungarocontrol, LPS Slovakia and Slovenia Control. FABEC is represented by DFS, ENAC and Skyguide. In addition, NATS joined in 2015. Based on this first successful step, the QUASAR Task Force started the process of generating question pools for the 17 qualification streams as defined in the EU regulation. The question set for the first stream

“Qualification Shared” has finalized. Beside this, QUASAR members offer a web based platform to conduct on-line assessments.

ATSEP (Air Traffic Safety Electronics Personnel) training managers from FAB Central Europe and FAB Europe Central together with their colleagues from NATS have developed a new common pool of assessment questions to standardise the assessment process for ATSEP training. The objective of this Inter-

FAB initiative is to fill the gap between the requirements defined in the EU Regulation 2017/373 that describes the minimum requirements, but does not define in which way air navigation service providers have to train their staff. To standardise this process, training experts have defined a question pool for the ATSEP basic training containing more than 600 validated questions to be used by the partners The first ATSEP basic assessments have been conducted; this demonstrated the high quality of the questions with respect to comprehensibility, clearness, depth and relation to training objectives.

- Safety: 0
- Capacity: 0
- ANS Cost Efficiency: +
- Environment: 0

Examples are:

FAB CE: All ANSPs

FABEC: DSNA, ANA, DFS, MUAC, Skyguide, LVNL

UK-Ireland FAB: NATS

DANUBE FAB: Common training system

1.8.3 Social Dialogue Committee

Three layers of Social Dialogue meetings exist:

a. First layer, the Social Dialogue Committee (SDC): at least two meetings per year, where the high-level framework of ongoing FAB developments are presented and discussed. This committee is formal and had terms of reference signed by all parties.
b. Second layer: meetings between ANSP experts, the relevant CM of the standing committees and social partners. The second layer meetings are held on ad-hoc basis to address specific matters or areas topics raised by either the ANSPs or the social partners.
c. Third layer: held on ad-hoc basis in case of issues and concerns raised in the first and second layer meetings, requiring further discussion and comprehension. These meetings aim to strengthen, enhance and develop the social dialogue process.

Some FABs are using only specific layers whereas other FABs combine the Social Dialogue with other Stakeholders.

Examples are:

FABEC with all three layers of the Social Dialogue in use.

BLUE MED: two key fora have been identified to guarantee International Trade Unions and International Professional Staff Associations participation in the BM FAB: an annual Social Forum and *ad-hoc* Social Forums. The Social Forum (SF) is a meeting where the involved parties discuss interactively on “high level” FAB policy issues following the FAB implementation, and especially its social impact and consequences; *ad-hoc* Social Forum meetings are called whenever, following SF activities, ITUs and IPSAs identify specific items of high interest and consideration to be further discussed.

DANUBE FAB: Social Consultation Forum

2 COSTS OF FAB ACTIVITIES

The costs typically vary from ANSP to ANSP and from State to State.

The budgeted costs are calculated based on the following cost elements which are assumed to be a good average:

- Human resources at an average rate of 800 euro per man-day
- One FTE is the equivalent to 1600 hours (200 days each with 8 hours)
- Missions at an average rate of 500 euro per mission
- Procurement which is organised with the FAB Common Budget (with costs that are shared according to the corresponding FAB mechanism which may vary from FAB to FAB).

In terms of a pragmatic approach it is assumed that the above-mentioned assumptions remain valid for the whole period of the CBA.

2.1 At FAB level

The diverse organization of the FABs lead to a diverse cost structure. Some FABs execute services at FAB-level which others provide at ANSP-level. The heterogeneities have been only partially taken into account. It has been left to the FAB's discretion which activities they would consider to be needed to manage and coordinate a FAB and its activities. Also, not all FABs have participated in this analysis. Therefore the FABs which could provide data were summed up and the intermediate result was extrapolated in accordance with the share of the traffic.

2.1.1 Internal Resources

For the execution of the overall coordination at all FABs - as well as on States as on ANSP level - it has been extrapolated that an effort of approx..17 FTE is needed. This would mean per FAB less than 2 FTE as an average are needed.

Based on the assumptions made with 200 man-days per year and 800 euro per man-day the overall effort is 2.708.000 euro.

2.1.2 Missions

For the coordination of FAB activities and consultations there is the estimated need to for each FTE to travel approx. 40 times per year. The travel costs are therefore assumed to be 338.000 euro.

2.1.3 Other Costs

Some FABs are using to execute their tasks other resources than internal ones and procure external support. In addition for some of the activities as described in this paper some other goods are procured such as office rental, office materials, telephones, the maintenance of webpages or insurances.

The costs reported and extrapolated amount up to approx. EUR 2.000.000.

2.1.4 *Summary Costs at FAB Level*

The annual costs at FAB level are the following:

Internal resources (as in 2.1.1.): EUR 2.708.000

Missions (as in 2.1.2.): EUR 338.000

Other Costs (as in 2.1.3.): EUR 2.000.000

In sum the annual costs in 2017 for coordinating the FAB activities and managing the FABs are at EUR 5.046.000 or roughly 5 Mio EUR.

2.2 At ANSP and States level

The resources used at States and ANSP level are usually dedicated to certain projects or activities. As in this document most activities are only being assessed on a qualitative basis and therefore no monetary benefits are being taken into account, there are neither any monetary costs being considered.

For the X-MAN project there is a net present value available which means that the costs for the conduction of this projects has already been taken into account.

For the Free Route Project (FRA) there is only a benefit available. As the assignment of costs to this project on a European scale would mean a very significant effort, it is assumed that some 5% of the benefit of the projects can be considered as an effort. Therefore, the benefits of the Free Route Project will be reduced by a sum of 25 million euro..

2.3 Summary of Costs

The costs of FABs which have provided their data stand for roughly two thirds of European air traffic. In order to provide an idea at the European scale the results have been extrapolated with the share of air traffic.

The data which has been gathered shows quite some divergence: some FABs use only internal resources, others use mainly external resources and some ANSPs use their FAB to execute some activities which seem to be more cost-effective at the FAB level and therefore a high portion of “Other Costs” can be found. In other FABs “Other Costs” does not exist. However, all FABs have a significant amount of travel costs which lies in the nature of the FABs and its European idea: coordination needs some travelling between the different actors. Again, the travel costs are quite diverse

The overall annual costs to manage a FAB and coordinate the execution of its activities is assumed to be EUR 5.046.000.

3 BENEFIT OF FAB ACTIVITIES

3.1 Qualitative Overview

FABs are conducting or planning some 77 projects and activities (65 in the ANSPs' domain, 12 in the States' domain) leading to positive qualitative results[1] and in some cases to quantitative results[2]

Of the 77 activities captured, all of which contributing to the performance of the 5 FABs participating in the study

- 14 activities increase the safety level;
- 15 activities increase capacity;
- 16 activities support environmental targets;
- 6 activities increase efficiency.

For 22 out of the 77 activities/projects, a qualitative assessment of the expected impact on performance was available.

Note 1: for activities with a qualitative assessment only it is assumed that the benefits will at least cover the costs. Note 2: see 'Quantitative Overview' below.

3.2 Quantitative Overview

For the following projects comprehensive benefits are available:

Extended Arrival Management (X MAN): Net Present Value = € 238,253,979

The benefits of X MAN are considerably higher as the costs of the project have been included already.

Free Route Airspace: According to the Network Manager there have been benefits for the Airspace User from 2014 onwards of 500 million euro. As the implementation of Free Route is ongoing and only to be completed in the next decade a very conservative approach would be to consider a fourth (for the four years of 2014, 2015, 2016 and 2017) part of the sum of 500 million euro of benefits as an annual benefit, meaning that the annual benefit would be at least 125 million euro.

Joint International Representation: According to FAB CE calculations the travel costs are reduced by EUR 80.000 p.a. using a joint FAB representation for SESAR, INEA, EUROCONTROL working groups or Social Dialogue.

3.3 Summary of benefits

FABs are contributing to a Single European Sky with a vast range of activities in all domains. Most of the benefits have been assessed in a qualitative manner (see 3.1.). For some larger projects a quantitative assessment is available (see 3.2.) and this information will be used for the calculation of a Net Present Value.

PART III – ADDED VALUE OF A FAB

1 GENERIC CBA 2018

1.1 General Approach

Results of the CBA are expressed in the Net Present Value (NPV). The NPV is calculated by displaying all discounted cash flows per year which are generated by the included activities. The budgeted cost for implementation and operational costs of an implemented activity in the time period 2014 till 2029 are set off against the quantified benefits that could be achieved by that activity in that same time period. Cost incurred earlier by the same project can for technical reasons such as the non-availability of project cost controlling at FAB level not be taken into account.

This entails that there will be activities with a positive NPV and others with a negative NPV. In general terms, activities with a positive NPV are those that benefit FABs performance directly. More specifically and in the majority of cases, the benefits materialise at the side of the airspace users whilst the costs are borne by the ANSPs or Member States.

Projects which benefit FAB performance directly can be expected to deliver benefits to airspace users in several performance areas, depending on the nature of the project. Especially the Airspace Design projects should deliver significant benefits in the area of Environment (flight efficiency) or Capacity. Nevertheless, due to the unavailability of any reliable information in many Key Performance Areas, the CBA model could not take all expected benefits into account, but focuses on flight efficiency.

Next to the activities benefitting FAB performance directly, there is a significant amount of FAB activities which benefit FAB performance only indirectly. These relate mainly to governance bodies (overhead) and diverse activities in the different domains. The activities are grouped together and introduced in the CBA as cost only, hence the negative NPV.

1.2 *Assumptions and Parameters*

In order to detail a model all relevant input data has been derived from this document. The following parameters will be used:

- Base year of the calculation is 2014 as from this year some of the relevant benefit figures seem to be derived.
- Inflation rates Eurostat
- EUROCONTROL Standard Inputs for Cost-Benefit Analysis (formally Version 6.0, September 2013)
  - Interest rate of 4% used to obtain discounted present value
- Inputs per FAB (provided by FABs)
- Information about the projects' individual costs and benefits, received as stated in this document;
- Expert judgement of the focal points;

1.3 *Result of the Analysis*

The results of the CBA model in terms of costs, benefits and the related Net Present Value (NPV) from the base year 2014 until 2029 are included in the table below. It is based on the assumption as stated in the previous chapters.

It must be noted that the benefits quantified for the two operational projects below the performance cases have been conducted by the Network Manager (Free Route) and SESAR (X MAN).

Activity	Total Nominal Cost 2014-2029 in Euro	Quantified Benefit 2014-2029 in Euro	NPV 2014-2029 discounted to base year 2014	Source
Free Route Airspace (FRA)	25 million euro	2.000 million euro	1.364,8 million euro	Network Manager
Extended Arrival Management (X MAN)			238.253.979	SESAR
Joint International Representation		1.200.000	889.471	FAB CE
TOTAL			**1.604 million euro**	