# FABEC Implementation Phase

# Environmental Case

## EC Information

## Annex O

Co-financed by the European Union
Trans-European Transport Network (TEN-T)

## Document Summary

| | |
|---|---|
| **Objective:** Provide information on FABEC contribution to reduction of the Aviation Environmental Impact. | |
| **Origin :** *SC ENV* | **Audience :** FABEC Provisional Council, ANSCB, ASB, AFG, European Commission |

| | |
|---|---|
| **Title :** | Environmental Case; EC Information; Annex O |
| **Reference :** | IP - EnvironmentalCase_AnnexO_v1.1.docx |

| | | | |
|---|---|---|---|
| **Version :**1.1 | **Date:***05.04.2012* | **Status :**☑ Draft<br>☐ Released | **Classification :** ☐ Public<br>☑ FABEC limited<br>☐ Addressees limited |

## Document Change Record

| Version | Date | Reason for changes | Author of changes |
|---|---|---|---|
| 1.0 | 02.04.2012 | Document completed with update of FRA benefits | ELP |
| 1.1 | 05.04.2012 | Editorial and format changes | ELP |
| | | | |

## Approvals

**Name:** Elisabeth Peeters  **Signature:**

**Function:** CM SC ENV

**Date:** 11 April 2012

## Quality Control

**Name:** Manuel De Klerck  **Signature:**

**Function:** AFG Quality Manager

**Date:** 12/4/12

## CONTENTS

# 1 INTRODUCTION

## *1.1 Purpose of the document*

This document has been produced on request by the FABEC AFG to demonstrate the contribution of the Functional Airspace Block Europe Central (FAB EC) to a reduction of the aviation environmental impact.

## *1.2 Context of the document*

Art. 9a.2(d) of Regulation (EC) No. 550/2004 (the airspace Regulation), amended by Art. 2.5 of Regulation No. 1070/2009, requires that “a FAB shall, in particular, be justified by its overall added value, including optimal use of technical and human resources, on the basis of a cost-benefit analysis”.

Annex 1, part II, point 4, item (d) of the Commission regulation (EU) No 176/2011 of 24 February 2011 (on the information to be provided before the establishment and modification of a functional airspace block), adds the following specific requirement on environment:

> *“The Member States concerned shall provide statements confirming that:*
>
> *…*
>
> *(d) the functional airspace block contributes to a reduction of the aviation environmental impact;*
>
> *“*

## *1.3 The environmental approach*

Environment is one of the identified key performance areas of the Single European Sky.

Main contributions of FABEC to environment are through projects enhancing operational efficiency like for instance shorter routes or better predictability. Also vertical efficiency by introduction of CDO-facilitation at airports is a focus area of FABEC.

Environment is included in the global FABEC mission statement. FABEC ANSPs added further detail on their ANSP environmental mission.

Assessing fuel and emission savings has become a systematic part of the evaluation of operational initiatives in the FABEC domain.

# 2 THE FABEC & FABEC ANSPS ENVIRONMENTAL MISSION STATEMENT

## *2.1 FABEC Mission Statement*

The FABEC global mission statement reflects the importance that FABEC assigns to environment

> *Our common air navigation services are to provide airspace users in a seamless European airspace with the highest level of safety, thus generate significant added value while the utmost effort is made to reduce the impact on the environment.*

## *2.2 FABEC Objective on Environment*

The FABEC Mission Statement is complemented by several objectives of which the objective on environment is:

> *FABEC will considerably reduce the environmental impact per flight by improving routes, flight profiles and distances flown, in line with broader European programs.*

## *2.3 Further refinement of FABEC ANSPs Environmental Mission*

FABEC ANSPs further refined their environmental mission as follows:

### *FABEC ANSP environmental Mission Statement*

We FABEC ANSPs realize that our common actions have an impact on the environment.

We are therefore committed to play our role in the contribution of an effective environmental system, aiming at improving the overall environmental performance and recognising interdependencies with other key performance areas.

We do so by:

- Monitoring the FABEC environmental performance
- Complying with relevant environmental regulations
- Screening for environmental effects in an early stage of the FABEC-projects
- Estimating $CO_2$-reductions & identifying triggers for potential noise effects for FABEC-operations projects
- Considering mitigation options when developing FABEC-projects
- Promoting environmental awareness
- Communicating our successes

.

### 2.4 Complete FABEC ANSPs environmental Mission statement

***FABEC Mission Statement and FABEC Objective on Environment***

**FABEC Mission Statement**

*Our common air navigation services are to provide airspace users in a seamless European airspace with the highest level of safety, thus generate significant added value while the utmost effort is made to reduce the impact on the environment*

**FABEC objective on Environment**

*FABEC will considerably reduce the environmental impact per flight by improving routes, flight profiles and distances flown, in line with broader European programmes.*

***FABEC ANSP environmental Mission Statement***

We FABEC ANSPs realize that our common actions have an impact on the environment.

We are therefore committed to play our role in the contribution of an effective environmental system, aiming at improving the overall environmental performance and recognising interdependencies with other key performance areas.

We do so by:

- Monitoring the FABEC environmental performance
- Complying with relevant environmental regulations
- Screening for environmental effects in an early stage of the FABEC-projects
- Estimating $CO_2$-reductions & identifying triggers for potential noise effects for FABEC-operations projects
- Considering mitigation options when developing FABEC-projects
- Promoting environmental awareness
- Communicating our successes

**Figure 2-1 : FABEC ANSPs Environmental Mission Statement**

# 3 FABEC STANDING COMMITTEE ENVIRONMENT

To ensure that environment is duly taken care of the FABEC ANSPs established a dedicated Standing Committee on environment.

The FABEC Standing Committee Environment focuses on integration of environment in projects with a relevant potential for environmental contributions as well as on environmental KPIs.

Each of the projects with a potential relevant impact on environment has a dedicated environmental focal point, which is also member of the performance case drafting team of the project.

For the subject of environmental performance the Standing Committee works closely together with the FABEC AFG/PMG (AFG=ANSP FABEC Group; PMG = Performance Monitoring Group), in a concern of a harmonised approach to the different performance domains.

FABEC AFG/PMG in its turn liaises with the States (Provisional) Financial and Performance Committee for the different performance KPAs.

# 4 ENVIRONMENTAL CONTRIBUTIONS OF INITIATIVES IN THE OPS DOMAIN

## *4.1 Early Implementation Packages Environmental contributions*

### 4.1.1 AmRuFra

#### *4.1.1.1 Description of the initiative*

*AMRUFRA - named after the AMsterdam East sector, the RUhr sector and the Langen sectors surrounding FRAnkfurt - aims to optimize the main civil air traffic flows from/to a pair of major expanding European hubs - Frankfurt and Amsterdam airports - and to balance both civil and military airspace requirements in the Netherlands and Germany.*

*The basic principle of the AMRUFRA project is to split Amsterdam and Frankfurt departures laterally and to rearrange surrounding flows in a more effective way. In order to optimize the main traffic flows, a common airspace re-design has been developed by the main partners: DFS, LVNL, Maastricht UAC and the Dutch and German military partners.*

*AMRUFRA was implemented on 11 March 2010.*

#### *4.1.1.2 Contribution to the Environment (estimates dated May 2009)*

Using the SAAM VST model, the environmental performance benefits of the AmRuFra project were estimated.

A comparative run was made using a reference scenario (actual) from the busiest day ever (27-JUN-2008, 24 hrs) projected into the AMRUFRA airspace and route network, planned to become operational on 11-MAR-2010. This includes the DLD resectorisation.

The total scenario contained over 3000 individual flights, of which 977 were relevant for the AmRuFra airspace scope.

It was found that 355 flights were positively impacted by the AmRuFra changes:

| Savings Module | Number of flights | Length (NM) | Fuel (Kg) | $CO_2$ (Kg) | NOx (Kg) |
|---|---|---|---|---|---|
| **AmRuFra vs. VST** | **355** | **-1200** | **-10000** | **-32000** | **-26** |

**Table 4-1: Savings per day, simulated for the busiest day ever 27-Jun-2008, 24hrs)**

This means that on average, these flights gain >3,3 NM, saving >28 Kg of fuel per flight.

Together they represent a reduction of 150 minutes flying time.

Additional fuel savings will also be achieved owing to better fuel predictability, which will minimise contingency fuel uplift.

*4.1.1.3 <u>Summary for AmRuFra</u>*

Results as simulated for the busiest day ever (27-Jun-2008, 24hrs):

- 1200 NM / day
- 10000 kg Fuel /day
- 31500 kg $CO_2$ / day
- 26 kg $NO_x$ / day

Additional fuel savings will also be achieved owing to better fuel predictability.

### 4.1.2 Night Network

*4.1.2.1 <u>Description of the initiative</u>*

*Under the aegis of the FABEC Airspace Design TF, the FABEC Night Network Working Group (FABEC NN WG) was tasked to deliver an early implementation package for a night network by the end of 2010 with an immediate implementation target.*

*The work of the FABEC NN WG is generally related to the geographical area of FABEC. The work programme also comprises the coordination with other WGs or neighbouring ANSPs as appropriate. The general airspace design and airspace management principles, identified during the Feasibility Study also apply to the airspace design process of the Night Network WG.*

*In line with the agreed ToRs the FABEC NN WG has developed a night network composed so far of 189 (one hundred eighty nine) proposals.*

- *The NN-WG is newly tasked to look into further night network development: by extending the applicability period where and when feasible*
- *by opening new proposals stemming from above extended applicability period.*

*Further developments in the Night Network are not considered in this environmental statement.*

*4.1.2.2 <u>Contribution to the Environment</u>*

***Flight-efficiency calculation***

- All FABEC NN proposals were assessed with the SAAM tool, under the assumption that all FABEC NN packages from Phase 1 to Phase 6 (August 2010) had been implemented.
- A traffic sample representing the busiest week in Europe in 2009 (27 June to 4 July) was used to assess the potential benefits of specific FABEC NN proposals. Traffic was extracted within FABEC Area only between 22.00–04.00 UTC for all seven consecutive nights.
- A traffic sample from 21-28 November 2009 was used in combination with the Summer traffic sample, to make an approximate calculation of annual benefits, being representative of an average week over the year.

- The potential savings were multiplied to give the yearly average benefits.
- Calculations of the annual savings in terms of fuel, $CO_2$ emissions and Euros were made in line with figures used in the FEP.
- Potential benefits estimated in this study were compared against a reference scenario that assumed no FABEC NN.
- Potential benefits were calculated at network level nevertheless, it could be concluded that they result from the implementation of the FABEC NN proposals.
- Individual assessment of the FABEC NN proposals were extracted from the network and when there were possibilities, a certain number of connecting proposals were logically grouped,

To obtain year values, the weekly number of affected flights per ANSP (all City Pairs) was multiplied with 52. To get the fuel saved per flight, the average fuel saving was calculated.

Availability time: 22.00 – 04.00

- Ca 4.800 tons fuel/year
- Ca 800 thousands NM/year
- Ca 16.000 tons $CO_2$/year
- Ca 4 million Euro/year

Availability time: 21.30 – 04.30

- Ca 6.500 tons fuel/year
- Ca 1million NM/year
- Ca 21.500 tons $CO_2$/year
- Ca 5.4 Million Euro/year

Availability time: 21.00 – 05.00

- Ca 8.500 tons fuel/year
- Ca 1.4 million NM/year
- Ca 28.000 tons $CO_2$/year
- Ca 7 million Euro/year

#### 4.1.2.3 *Summary for Night Network*

Results on a yearly basis, based on SAAM analysis and considering a general applicability period of 6 night hours (22:00-04:00), taking into account the 115 proposals already implemented:

- 800,000 NM / year
- 4,800 tons of fuel /year saved
- 16,000 tons of $CO_2$ /year reduced

### 4.1.3 City Pairs

#### *4.1.3.1 Description of the initiative*

*In 2009, FABEC started to work on improving the so-called 50 most penalised city pairs. Based on a list provided by Eurocontrol, civil and military experts were investigating solutions for specified routes connecting major airports which deviate significantly from the ideal great circle routings. Most prominent examples are Amsterdam/Madrid or Paris/Munich. They have been notorious for decades and are often used by aircraft operators to illustrate the inefficiency of ATC as such.*

*FABEC experts proposed several shorter routes given the situation in which the core area is affected by a combination of main civil en-route flows, a huge amount of vertical movements and a lot of segregated military areas.*

*For implementation the working group divided its work into packages. Packages I to V are already implemented. The working group found further city pairs to analyze in a next phase of the project.*

#### *4.1.3.2 Contribution to the Environment*

***Flight-efficiency calculation for Tables savings 2010 and 2011***

**Two different traffic samples have been considered:**

week 15-21 Nov 2010 (175247 flights, LOW)

and

week 26 June-3 July 2011(217171 flights, HIGH)

Difference: 41926 flights = +23.9%

**The week 15-21 Nov 2010 was evaluated according to the following:**

SAAM assessment of the implemented measures, according to the real planning

- Date of work 27 November –16 December 2010
- SAAM_V3_7_5_Release was used
- VST_AIRAC_1012_CFMU_341_18NOV2010_Version_Final was used as SCENARIO
- BASELINE: SCENARIO minus specific measures
- Traffic sample: week 15-21 Nov 2010 (real planning, some new routes implemented on 21 Oct 2010)
- From the traffic sample the specific sub so.6 has been extracted
- The specific so.6 was transformed to traffic demand .exp
- The traffic demand was assigned on REFERENCE and on SCENARIO and only the flights on the shortest route were FILTERED
- The FILTERED traffic was assigned on reference
- DELTA and SCENARIO ECONOMY were calculated and validated
- Specific pictures have been produced (one for each measure)
- A global picture has been produced
- The global results have been obtained by summing the single proposals' results

**The week 26 June-3 July 2011 was evaluated using the following parameters:**

- SAAM_V3.8.1 Beta and SAAM 3.8.6_Release were used
- VST_AIRAC_1012_CFMU_341_18NOV2010_Version_Final was used as BASELINE (without the implemented measures, by means of penalization 1000 NM) and SCENARIO (with the implemented measures)
- The real planning (from DDR) has been used as the starting point (7 single days were combined)
- The exp2 for the seven days has been downloaded from DDR and combined in only one file
- For each implemented measure the specific sub so.6 file has been extracted
- The corresponding EXP2 sub file has been extracted (matching files)
- This exp2 has been assessed by SAAM on BASELINE and SCENARIO network
- Processing: Assignment and profile were carried out
- From the output SCENARIO so.6 the specific filtered so.6 has been extracted (only flights on the shortest route accepted)
- The corresponding BASELINE so.6 has been extracted (matching files)
- From these files (BASELINE and SCENARIO) the Scenario Economy has been calculated
- These file (BASELINE and SCENARIO) have been transformed in network to calculate the DELTA
- The global savings table has been calculated by summing the single measures figures.

| | | Savings | | | | |
|---|---|---|---|---|---|---|
| 2010 | Flights | Length | Time | Fuel | Co2 | NoX |
| AMEXO | 61 | 200,39 | 28,12 | 1 039,12 | 3 262,91 | 12,91 |
| ARGAX | 14 | 110,98 | 6,02 | 422,12 | 1 325,44 | 6,71 |
| ARKIP | 21 | 154,76 | 21,13 | 686,74 | 2 156,38 | 6,79 |
| DIRMO | 70 | 301,06 | 40,37 | 1 530,98 | 4 807,15 | 18,64 |
| DITON | 240 | 1 073,29 | 139,75 | 4 790,56 | 15 042,50 | 51,39 |
| GTQ | 123 | 2 341,55 | 323,10 | 13 626,64 | 42 787,50 | 166,19 |
| INGOR | 22 | -0,03 | 0,19 | 33,12 | 103,87 | 0,59 |
| IRKIS | 141 | 352,44 | 47,95 | 1 942,06 | 6 097,45 | 28,03 |
| LATAM | 129 | 2 165,46 | 371,56 | 17 646,91 | 55 410,77 | 278,48 |
| MOBLO | 246 | 1 725,40 | 225,80 | 7 833,09 | 24 594,76 | 92,92 |
| OTROT | 59 | 383,32 | 51,06 | 2 495,24 | 7 835,18 | 29,82 |
| PENEK | 54 | 111,03 | 15,29 | 296,98 | 932,74 | 3,62 |
| BATGA | 75 | 254,84 | 36,29 | 2 621,27 | 8 230,84 | 31,17 |
| ROUSY | 21 | 112,49 | 14,08 | 1 321,42 | 4 149,29 | 23,55 |
| TOSTU | 62 | 393,55 | 55,60 | 2 541,90 | 7 980,87 | 30,60 |
| UTABA | 25 | 560,51 | 74,68 | 2 810,94 | 8 826,12 | 34,75 |
| to LEBL FL350 | 40 | -0,39 | -24,18 | 7 316,97 | 22 974,90 | 158,78 |
| OSBIT | 86 | 439,46 | 64,50 | 2 685,66 | 8 432,94 | 35,15 |
| Total | 1 489 | 10 680 | 1 491 | 71 642 | 224 952 | 1 010 |

**Table 4-2 : City Pairs – Global saving for 2010**

| 2011 | Flights | Savings | | | | |
|---|---|---|---|---|---|---|
| | | Length | Time | Fuel | Co2 | NoX |
| AMEXO | 107 | 351,64 | 49,59 | 2 007,14 | 6 303,03 | 25,26 |
| ARGAX | 8 | 61,22 | 8,39 | 464,02 | 1 456,98 | 6,13 |
| ARKIP | 287 | 2 453,99 | 328,83 | 13 876,70 | 43 572,33 | 182,78 |
| DIRMO | 305 | 1 227,53 | 170,63 | 6 705,96 | 21 058,73 | 83,25 |
| DITON | 290 | 1 271,22 | 186,19 | 5 958,41 | 18 708,39 | 67,96 |
| GTQ | 103 | 2 423,32 | 357,59 | 17 271,97 | 54 233,98 | 213,69 |
| INGOR | 13 | 0,03 | 0,09 | 28,90 | 90,73 | 0,43 |
| IRKIS | 164 | 394,55 | 56,51 | 1 983,71 | 6 227,84 | 25,73 |
| LATAM | 126 | 2 006,06 | 324,08 | 15 335,95 | 48 155,19 | 227,34 |
| MOBLO | 572 | 4 115,03 | 554,28 | 21 435,64 | 67 306,83 | 270,25 |
| OTROT | 66 | 436,89 | 58,80 | 3 209,63 | 10 078,36 | 41,62 |
| PENEK | 81 | 186,36 | 17,61 | 1 462,27 | 4 591,86 | 25,77 |
| BATGA | 81 | 294,86 | 41,14 | 2 910,50 | 9 139,04 | 37,72 |
| ROUSY | 25 | 131,57 | 15,84 | 1 386,12 | 4 352,31 | 24,04 |
| TOSTU | 69 | 423,92 | 61,08 | 2 729,40 | 8 570,31 | 31,57 |
| UTABA | 36 | 789,55 | 104,14 | 4 025,56 | 12 640,18 | 51,44 |
| to LEBL FL350 | 64 | -0,50 | -21,18 | 10 782,25 | 33 856,22 | 227,77 |
| OSBIT | 104 | 531,46 | 77,52 | 3 221,49 | 10 115,44 | 44,08 |
| Total | 2 501 | 17 099 | 2 391 | 114 796 | 360 458 | 1 587 |

**Table 4-3 : City Pairs – Global savings for 2011**

#### 4.1.3.3 *Summary for City Pairs*

Results for the year 2011, based on SAAM analysis:

- 2501 flights
- 17099 NM / year
- 2391 minutes of flight per year
- 114796 kg of fuel /year saved
- 360458 kg of $CO_2$ / year reduced
- 1587 kg of $NO_x$ / year reduced

## 4.2 *Airspace Design Projects Environmental Contribution*

### 4.2.1 Project West

#### *4.2.1.1 <u>Description of the initiative</u>*

*The WEST project is the new name for the Hotspot KOK/DVR identified during the FABEC Feasibility Study. A final solution for this hotspot was not proposed during the FS and due to the complexity of the subject, it was agreed that development and implementation will be done in three steps (phases).*

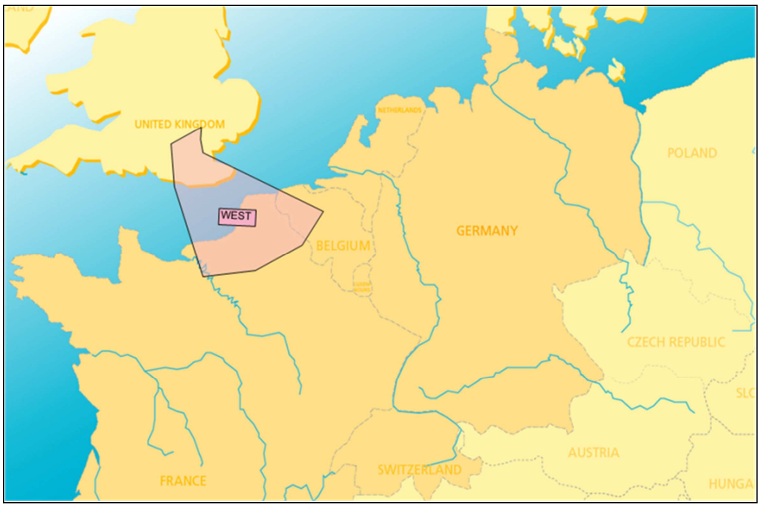


**Figure 4-1: AD project West; geographical scope**

***Phase I:***

*Project West, Phase I, deals with the introduction of new routes at the interface between Reims ACC and London ACC.*

*<u>Implementation date:</u> 17th Nov 2011 (sub phase 1A, interface Paris, Reims and London) and end of 2012 (sub phase 1B, Paris arrivals via DPE/EGLF Group inbounds)*

***Phase II:***

*Project West, Phase II, shall improve the interface between the UK and Belgium and involves the following CIV/MIL ANSPs (Units):*

- *NATS (LAC);*
- *MUAC;*
- *DSNA (Reims and Paris);*
- *Belgian Air Component;*
- *French Air Force;*
- *Belgocontrol.*

*The foreseen major changes are:*

- *Creation of a new route structure;*
- *Reshape of CBA1.*

*Those changes will be implemented whilst maintaining the current sector boundaries and DFL. The new route structure will be connected to the current route structure further to the east.*

*Target date for implementation: End 2012 to First quarter 2013*

***Phase III:***

*Phase III is foreseen to review the current airspace structure (sectorisation and route) to support better flight profiles and cross border operations.*

*Target date for implementation: 2014+*

*Phase I and Phase II can be implemented separately whilst Phase III is the continuation of the previous phases and will deliver the envisaged benefits of the entire West project (e.g. connection of the three eastbound route structure within the LUX area).*

*The project has progressed into the validation phase of phases I and II whereby a PRTS and RTS were performed. Leadership for this project lies at Belgocontrol.*

#### *4.2.1.2* *Contribution to the Environment*

Phase I

This project does not bring any tangible improvements on FABEC side, but has positive effects on the performance of NATS.

Phase II

As the design for Phase II is still foreseen to change, the contribution to the environment is not known yet.

A flight efficiency study for an earlier design of Phase II was conducted using SAAM simulation. The simulation was based on a military off scenario. Calculations were based on Weekends, National Holidays and Military Off days (120 days in total). This simulation for the earlier design of Phase II provided the following results.

- 503 flight simulated
- 1550 NM / Mil.Off Day saved
- 19486 kg Fuel / Mil. Off Day saved
- 61192 kg $CO_2$ / Mil. Off Day reduced
- 215 kg $NO_x$ / Mil. Of Day reduced

However to make the project acceptably safe, additional restrictions are to be implemented: the project was based on RNP1 and needs to be adapted to BRNAV5. As such, the flight efficiency calculations are not relevant anymore and will need to be updated including the restrictions mentioned above. For implementation an updated environmental assessment will be drafted.

Phase III

For the West Phase III project no estimates can be made yet, because the AD LUX project is actually not in a status to have a closer look at the interfaces between the West and the LUX projects.

### 4.2.2 LUX Project

#### *4.2.2.1 <u>Description of the initiative</u>*

*The LUX Airspace Design project, under leadership of DFS, will address the key bottleneck in the core area around Luxembourg. The challenge for this project is, despite several failed attempts in the past, to achieve 3 main objectives, being:*

- *To realise GAT route network connections for all other projects connecting with the LUX area*
- *To alleviate the persistent GAT route network bottleneck in the LUX area*
- *To realise adequate capacity improvements to absorb increased GAT traffic demand, enabled by the other FABEC and local ANSP airspace projects*

*In addition, a military Cross-Border Area CBA116 across France and Belgium shall be realised replacing existing military areas.*

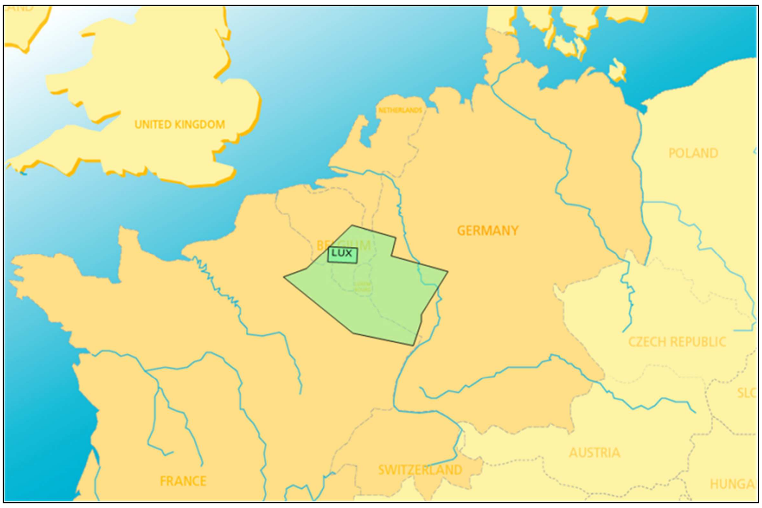


**Figure 4-2: AD project LUX; geographical scope**

*To support the realization of these goals, the project will deliver:*

- *a validated airspace design compliant with the FABEC feasibility study with the target to enable implementation of these structures;*
- *a corresponding implementation plan for each of the implementation steps.*

*All implementation activities shall actively contribute to the FABEC performance targets (safety, efficiency, mission effectiveness etc.)*

*For the implementation of the different elements of the project a stepped approach will be utilised. First an overall design will be made and then the different steps will be* *identified, validated and implemented one by one. The LUX area is geographically situated in the centre of the FABEC AD areas. It therefore plays a key role in achieving the FABEC performance goals. To ascertain results, it is essential that a high level overall design/concept is made on FABEC level, thus providing strategic direction and coherence for the different AD projects. Next to this FABEC overall concept, the IP LUX project will make a high level overall design for the area as specified in the scope of the project.*

*To ensure seamless connections of the proposed route structure and airspace design with the adjacent FABEC AD projects, the IP LUX project will be focus on into 5 smaller areas of interest:*

1. *LUX Core, comprising of the LNO/DIK/LUX axis, the major area within the IP LUX scope and essential for any improvement of the envisaged performance improvement.*
2. *LUX South-West, the area that interfaces with TRA South/CBA16 and the Point Merge System for Paris Charles de Gaulle.*
3. *LUX South-East, connecting to the SWAP area and the CBA22 and crucial for the accommodation of a third North/South route.*
4. *LUX West, interfacing with the West 2 package and essential to connect to the extra West/East route resulting from the design of this package.*
5. *LUX North-East, interfacing with Central West.*

*The project started working in March 2011.*

##### *4.2.2.2 Contribution to the Environment*

Due to the very early stage of this project a definition of potential environmental benefits is not possible at the moment

### 4.2.3 SE Project

##### *4.2.3.1 Description of the initiative*

*The objective of the South East airspace project, led by Skyguide, is to implement the airspace changes required to achieve the CBA 22 and the SWAP, a.o. tackling the TRA (sadingen) Hotspot identified in the Feasibility Study.*

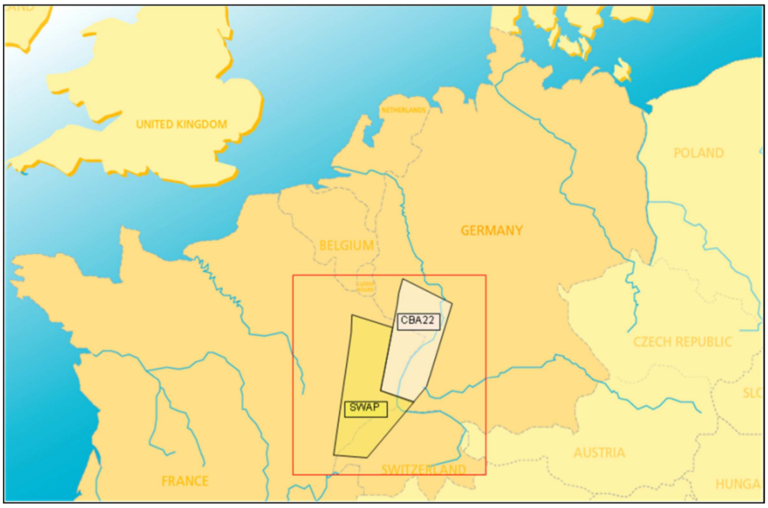


**Figure 4-3: AD project South-East; geographical scope**

*Given that parts of the SE airspace project are closely linked with the LUX airspace project it was envisaged to implement the airspace changes in two phases:*

***Phase 1: SWAP***

- *Swap the one way traffic flows on routes UN852 and UN853;*
- *Create duplicate parallel routes to allow for segregation of over flights from climbing and descending flights.*

*<u>Target date for implementation:</u> First Quarter 2013*

***Phase 2: CBA 22***

- *Establish a new Cross Border Area (CBA) 22 for use by the French, German and United States Air Forces:*
  - *Merge the current French TSA 22, R322 and R323 military areas with the German TRA Lauter (R205 and R305) military areas;*
  - *Modify the shape (lateral and vertical boundaries) of the merged areas to allow for optimization of the civil route network whilst continuing satisfying Military requirements.*

*<u>Target date for implementation:</u> First Quarter 2014**.***

#### *4.2.3.2 <u>Contribution to the Environment</u>*

A Eurocontrol SAAM study was conducted to assess the efficiency improvements that should be expected for the Project SE package:

**<u>Phase 1 SWAP:</u>** efficiency in the network will be drastically improved in the region.

<u>Benefits:</u> up to **8 Million Euro will be saved** in regard to the 3500 NM/day or 27 tons fuel/day or 83 tons of $CO_2$ saved.

**<u>Phase 2 CBA22:</u>** may have a negative impact on some civilian traffic. This penalisation represents the equivalent of approximately 0.7-0.8 Million Euro per year. Additional Benefits will be seen as it will allow the full completion of the UN852/UN853 SWAP. Additional benefits: Up to 2 Million Euros **will be saved** in regard to the 1300 NM/day or 7 tons fuel/day or 24 tons of $CO_2$ saved.

**<u>CBA22 is also key enabler of the FABEC LUX project. Additional flight efficiency is expected in this project.</u>**

#### *4.2.3.3 <u>Summary for SE project</u>*

- 4800 NM / Day saved
- 34 ton Fuel / Day - saved
- 107 ton CO2 / Day reduced

### 4.2.4 AD Cross Border Area (CBA)-Land/ Central West

#### *4.2.4.1 <u>Description of the initiative</u>*

*CBA Land/Central West airspace project is the new denomination of the former ARKON/RKN Hotspot that has been identified during the FABEC Feasibility Study.*

*The objective of the CBA Land/Central West airspace project is to create and validate an airspace design compliant with the FABEC Feasibility Study for the Central-West area and the North area including a CBA Land.*

*See the following excerpt from the relevant Feasibility Study document on Airspace Design:*

> *"Since several years, the ARKON/RKN area is being recognised at ECAC level as one of the problematic core areas to be improved in order to cope with the rapid traffic growth. It involves 3 civil ANSPs and 2 military partners and has to accommodate major evolving traffic flows to/from Schiphol, Frankfurt and Düsseldorf airports together with numerous over-flying European traffic flows. Internal Dutch civil-military negotiation, begun within the AMRUFRA framework, led to the possibility of establishing some conditional ATS routes above TMA D thereby offloading the ARKON/RKN area, providing that sufficient compensation airspace for training purposes can be found in the North.*
> *The permanent opening of actual military training airspace above TMA D for civil traffic offers the opportunity to segregate GAT flows and thereby significantly alleviate the ARKON/RKN area."*

*The project team, under the leadership of LVNL, will develop the necessary airspace and route designs as a follow-up on the work of the former ARKON/RKN WG that has been done between September 2008 and October 2009. The scope is to provide finalized designs and operational concepts and an implementation plan for single implementation steps.*

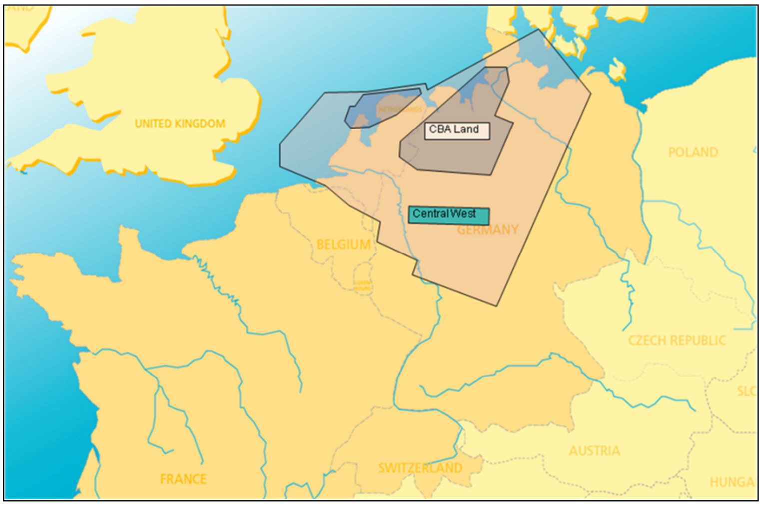


**Figure 4-4: AD project CBA Land / Central West; geographical scope**

*At the moment the project is in the design phase. A stepwise implementation is planned for the 4.Q 2015 and 4.Q 2016.*

#### *4.2.4.2 Contribution to the Environment*

Due to the early stage of this project a definition of potential environmental benefits is not possible at the moment.

## *4.3 Airspace Strategy Projects Environmental Contribution*

### 4.3.1 Free Route Airspace Project

#### *4.3.1.1 Description of the initiative*

*On the basis of the so called “Matterhorn Declaration”, agreed between the DGCAs of the FABEC states[1] the FABEC ASB endorsed new airspace principles and the related airspace vision and strategy on September 7th, 2011. These set out a three volume airspace concept for all FABEC airspace, split into:*

- *Free route airspace volume (FRV) over the greatest possible FABEC area based on common concept of operations, providing flexibility and flight efficiency for airspace users;*
- *Fixed route airspace volume containing multi-hub terminal area (TMAs) serving major airports or a number of adjacent airports in an extended TMA operation, with flexible boundaries and cross border sector groups;*
- *Transition airspace volume linking the Top 5 TMAs (Paris, Frankfurt, Amsterdam, London and Munich) and fixed routes airspace to free route and to other parts of FABEC, including a harmonised concept of operation for the implementation of arrival and departure management systems, providing capacity and flight efficiency.*

*The resulting conceptual view of the airspace design is shown in Figure 4-5:*

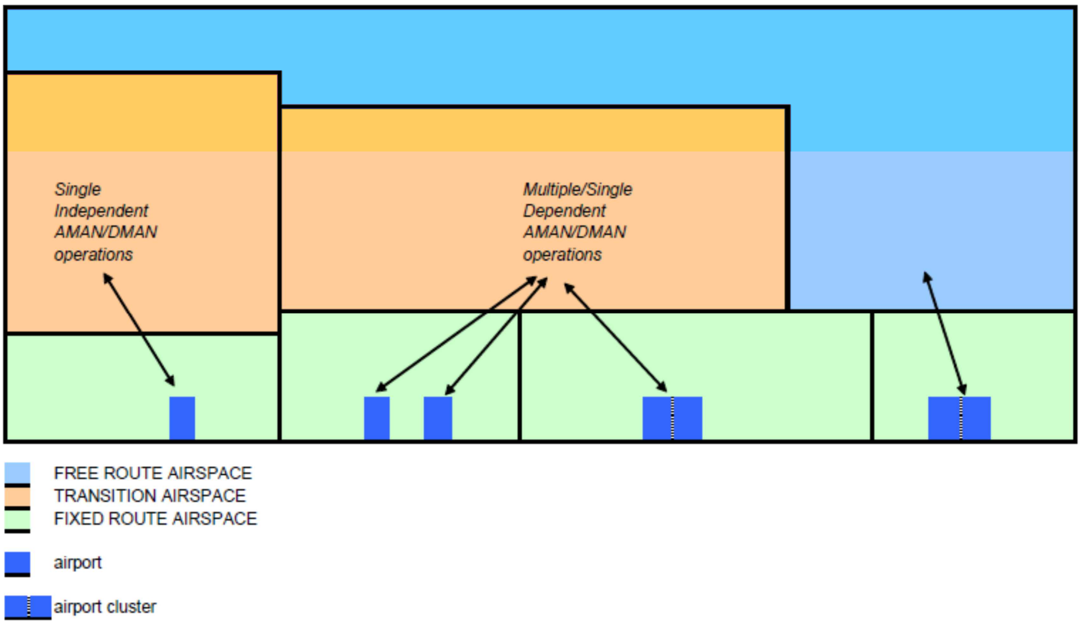


**Figure 4-5: Future Airspace Design for FABEC Airspace**

*A roadmap for the implementation of this concept was decided in Jan 2012. Nevertheless two projects already exist: FRAM in the MUAC airspace and FRAK in the Karlsruhe airspace.*

---

[1] May 23-24 2011

*Considering the nature and distribution of traffic within FABEC, the first implementation of free route launched in Maastricht and Karlsruhe, as well as the various technical means available locally, it was considered that different steps of FRA have to be described.*

*Keeping in mind the objective of a harmonized implementation, its phasing, with regards to each step of FRA, will be optimised even if not simultaneously introduced in each Control Centre.*

***Step 1: Implementation of direct connections in a defined airspace outside military activity***

- *Night*
    - *Extended night*
    - *Extension of current night network and/or creation of new direct connections*
- *Week-end*
- *Cross border when possible between ATC units within FABEC or with adjacent FABs*
- *FABEC wide (direct connections with entry and exit points on the boundary of the area of responsibility of FABEC).*

*Diverse combinations of above cases can be envisaged.*

***Step 2: Permanent (H24/7) implementation of direct connections in a defined airspace with active military areas, supported by implementation of advanced FUA***

*Step 2.a. Within ATC units*

*Step 2.b. Cross border when possible between ATC units within FABEC or with adjacent FABs*

*Step 2.c. FABEC wide (direct connections with entry and exit points on the boundary of the area of responsibility of FABEC).*

***Step 3: Introduction of Business trajectories (using SESAR deliverables).***

***Final Goal: FABEC wide Full Free Route concept, as defined in the FABEC Free Route Concept of Operations***

*This should be the achievement of the concept, as it should allow the users to plan their preferred routes, regardless of published points. It takes place in an environment where new technology and new tools are available. A strong collaborative work with SESAR Programme is likely to be fruitful. Several SESAR projects are already working on elaborating tools that will have possible enabling consequences regarding Free Route full concept, such as flight planning without reference to a Route Network.*

*It has to be noted, that some of the improvements coming from a Free Route Airspace are already shown in the City Pairs or Night Network EIP. Hence the calculation of benefits has to be carefully examined to prevent double counting.*

*The FABEC FRA roadmap has been elaborated by all civil and military ANSPs, by integrating the existing roadmaps from Maastricht and Karlsruhe and the local roadmaps proposed by the other ATC units.*

*Table 4-4 below depicts the local view within an ATC Centre. It doesn't describe the further cross-border initiatives.*

| ANSP | ATC Unit | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020............ 20XX |
|---|---|---|---|---|---|---|---|---|---|---|
| UPPER AIRSPACE | | | | | | | | | | |
| DFS | Karlsruhe/East Sectors | | 2 | | | | | | | 3 |
| | | 1 | | | | | | | | |
| | Karlsruhe /Central+West Sectors | | | 2 | | | | | | 3 |
| | | 1 | | | | | | | | |
| | Karlsruhe/South Sectors | 1 | | | 2 | | | | | 3 |
| MUAC | MUAC | | 1 | | | | | | 3 | |
| | | | 2 | | | | | | | |
| Skyguide | Geneva | | | 1 | | | | 2 | | 3 |
| | Zürich | | | 1 | | | | 2 | | 3 |
| DSNA | Reims | | | 1 | | | | | | 3 |
| | | | | | | 2 | | | | |
| | Paris | | | 1 | | | | | | 3 |
| | | | | | | 2 | | | | |
| | Aix | | | 1 | | | | | | 3 |
| | | | | | | 2 | | | | |
| | Bordeaux | | | 1 | | | | | | 3 |
| | | | | | | 2 | | | | |
| | Brest | | | 1 | | | | | | 3 |
| | | | | | | 2 | | | | |
| LOWER AIRSPACE | | | | | | | | | | |
| Belgocontrol | Belgocontrol | | | 1 | | | | | 2 | Step 3 as of 2024 |
| DFS | Langen | | | | | | | | | |
| DFS | Bremen | | 1 | | | | | 2 | | |
| DFS | München | | | | | | | | | |
| LVNL | FRA not considered for the time being | | | | | | | | | |
| ANA | FRA not considered for the time being | | | | | | | | | |

**Table 4-4: Roadmap FRA implementation**

### 4.3.1.2 *<u>Contribution to the Environment</u>*

FRA allows airspace users to fly direct routes, thus reducing flight distance flown, with consequent savings in fuel and $CO_2$. Furthermore, airlines have an added benefit of predictability from direct routes through FRA. Currently, direct routes are offered tactically and therefore airlines plan for sufficient fuel to fly the route as specified in the flight plan. With FRA, the airline has advance information that it will fly on the direct route and therefore it does not need to carry additional fuel for contingency.

Benefits of the various scenarios as defined in the FABEC FRA Road map have been estimated by comparing the Scenario (increased) traffic against the Free Routed traffic of that year ( Years 2013, 2016 and 2019 respectively).

| | Scenario |
|---|---|
| 2013 | **MUAC:** As planned and based on the FRAM roadmap;<br>**Karlsruhe:** As planned and based on the FRAK roadmap;<br>Munich UAC weekend routes similar to Karlsruhe SE sectors;<br>**DSNA:** based on current night network;<br>**Skyguide:** weekend routes FL245+. |
| 2016a | **MUAC:** Step 2 FL245+ and based on the FRAM roadmap;<br>**Karlsruhe:**<br>-Step 2 FL 315+ and based on FRAK roadmap;<br>-Night Network FL 245+;<br>-Cross-border within ANSP;<br>**DSNA Step 1:**<br>-Weekend routes FL 375+;<br>-Extended Night Network: FL 375+;<br>-Night Network FL 245+;<br>-Cross border within ANSP;<br>**Skyguide step 1:**<br>-FRA FL 245+;<br>-Cross border within ANSP. |
| 2016b | As for 2016a, except DSNA weekend route and extended NN FL 315+ |
| 2019a | Cross border FABEC (not actually modelled)<br>**MUAC** step 2 FL 245+ and based on FRAM roadmap<br>**Karlsruhe:**<br>-As planned (step 2) and based on FRAK Roadmap FL 315+<br>-Night Network FL 245+<br>**DSNA:**<br>-Step 1: Weekend routes FL 375+<br>-Step 1: Extended Night Network FL 375+<br>-Step1: Night Network FL 245+<br>-Step 2 FL 375+<br>**Skyguide:**<br>-Step 1 FL 245+<br>-Step 2 FL 365+ |
| 2019b | As 2019a, except:<br>**DSNA** Step 1: weekend and extended NN FL 315+, Step 2 FL 315+<br>**Skyguide** Step 2: FL 315+ |

**Table 4-5: FRA benefits scenarios**

Detailed information on the calculation of the environmental benefits can be found in attachment R.2 to annex R on the Cost Benefit Analysis.

The gains estimated for each scenario were calculated with the SAAM by comparison of current route network with the direct routes in the Free Route Airspace defined in the various Scenarios.

Benefits were extrapolated from the sample week to an average week in the year by applying a weighting of 0.874. This is to take account of the fact that the sample week was during the peak period for traffic and an average week's traffic and therefore benefits would be lower.

In addition to the reduced fuel burn due to reduced distance flown, there will be an additional fuel saving. This is related to the cost of carrying additional fuel on board the aircraft, as an aircraft must take on board the fuel necessary according to the filed flight plan.

Additional fuel is estimated (Standard Inputs for EUROCONTROL Cost Benefit Analyses, October 2009) to be 40kg per tonne of fuel, that is, a fuel carriage penalty of 4%. The average fuel consumption of a typical aircraft in cruise was assumed to be 7.8 kg per NM[2]. The fuel carriage benefit is 4% of the fuel savings.

For each kg of fuel saved, also 3.149 kg of $CO_2$[3]will be saved.

The environmental related results are summarised in the table below.

| Year | Length (NM) | Direct fuel benefit | | Fuel penalty benefit | |
|---|---|---|---|---|---|
| | | Fuel (ton) | $CO_2$ (ton) | Fuel (ton) | $CO_2$ (ton) |
| 2013 | -2,289,908 | -17,851 | -56,215 | -714 | -2,248 |
| 2014 | -3,332,193 | -25,977 | -81,802 | -1,039 | -3,272 |
| 2015 | -4,431,877 | -34,549 | -108,798 | -1,382 | -4,352 |
| 2016 | -5,575,653 | -43,466 | -136,876 | -1,738 | -5,473 |
| 2017 | -6,615,516 | -51,573 | -162,404 | -2,062 | -6,493 |
| 2018 | -7,702,308 | -60,045 | -189,084 | -2,401 | -7,561 |
| 2019 | -8,818,398 | -68,746 | -216,482 | -2,749 | -8,657 |
| 2020 | -8,991,860 | -70,098 | -220,741 | -2,803 | -8,827 |
| 2021 | -9,170,144 | -71,488 | -225,117 | -2,859 | -9,003 |
| 2022 | -9,352,034 | -72,906 | -229,583 | -2,916 | -9,182 |
| 2023 | -9,537,606 | -74,353 | -234,138 | -2,974 | -9,365 |
| 2024 | -9,726,935 | -75,829 | -238,786 | -3,033 | -9,551 |
| 2025 | -9,920,099 | -77,335 | -243,528 | -3,093 | -9,740 |

**Table 4-6 : FRA environmental benefits**

It has to be noted, that the benefit estimations are rather conservative, as the underlying SAAM simulation only reflects flight efficiency gains within the Area of Responsibility of each ACC. Savings stemming from FABEC-wide direct routings are not reflected yet.

[2] FABEC Free Route Performance indication v1.0, 12 January 2012.
[3] Standard Inputs for Eurocontrol CBAs, Edition 5.0, December 2011.

#### 4.3.1.3 <u>Summary for FRA (2013 numbers)</u>

- 7,854,165 NM / year
- 17,851 tons direct fuel / year
- 56,215 tons direct $CO_2$ / year
- 714 tons fuel penalty /year
- 2248 tons $CO_2$ /year thanks to lower fuel penalty

### 4.3.2 Extended cross boarder arrival manager (XMAN)

#### 4.3.2.1 <u>Description of the initiative</u>

*FABEC provides a unique opportunity to develop a harmonised approach to arrival management in the core area of Europe.*

*Within the Core Area, DFS (serving Frankfurt and Munich airports), NATS (serving London airports), LVNL (serving Amsterdam airport), DSNA (serving Paris airports) and Belgocontrol (serving Brussels airport), i.e. the ANSP-s serving the major Hubs, have implemented or intend to implement Arrival Management techniques within their Technical Systems and Operational Procedures.*

*However, these implementations are currently limited to the responsible Approach/ACC Units, except for Munich, where an extension of arrival management operations into the adjacent Vienna En-Route centre has been realised.*

*The effect of this is that - most of the times - only within Lower Airspace, arrival-sequence related methods are applied, leading to tactical instructions (speed-adjustments, vectoring) at the most difficult stage of the flight, and with the most penalising consequences for the environment (noise, $CO_2$ emission).*

*By extending the time-horizon of such Arrival Management techniques into adjacent and/or Upper Airspace, it is envisaged that the effects on the environment will be minimised, and at the same time, that controller workload in lower airspace will be reduced. It seems obvious that by extending the time-horizon of arrival management, the net effect will result in optimising hub operations and meeting airlines needs. Where a Gate-To-Gate concept would be the ultimate goal, this document tackles half of the equation: the En-Route-To-Gate half.*

*As an en-route centre is managing different traffic-flows (into different airports) which need now not only to be de-conflicted to ensure safety-levels, but also need to be optimised to increase Arrival-Management efficiency, special procedures and tools will have to be put in place. These tools and procedures in the feeding centre should be made as homogeneous as possible for the en-route controller, while still taking into account "local" arrival management techniques and capability levels in the receiving units.*

*Moving this arrival-management task (partially) into adjacent and/or upper airspace will:*

- *Require as much as possible system support (e.g. implementation of OLDI AMA message) and/or new operational procedures.*
- *Introduce additional workload to the Controller in the adjacent and/or upper airspace. This needs to be mitigated by appropriate system support (for example by integration of multiple AMAN feeds into an EMAN and implementation of MTCD).*

*The environmental and flight-efficiency improvements of applying these techniques in the en-route-phase can only be guaranteed if corresponding operational procedures are applied in the receiving ACCs.*

*It is very likely that the capability-level of implementing arrival-management techniques in en-route airspace is driven by technical means to support the concept. Important enablers are electronic coordination means both down- and upstream, and data link, which is expected to be the preferred means to pass arrival times etc. to aircraft, especially for en-route sectors.*

*It is however not excluded that improvements can already be achieved through enhanced operational procedures and techniques which do not depend on technical evolutions of the current ATM Systems.*

*The necessary extension of arrival management operations is expected to reach out to a horizon of about 200 NM around the major airports. Together, these horizons will cover almost the entire FABEC airspace. Therefore, most of the FABEC control centres will be affected by extended AMAN operations, some of which will need to feed several arrival streams for different airports/TMAs.*

*The situation is shown in Figure 4-6:*

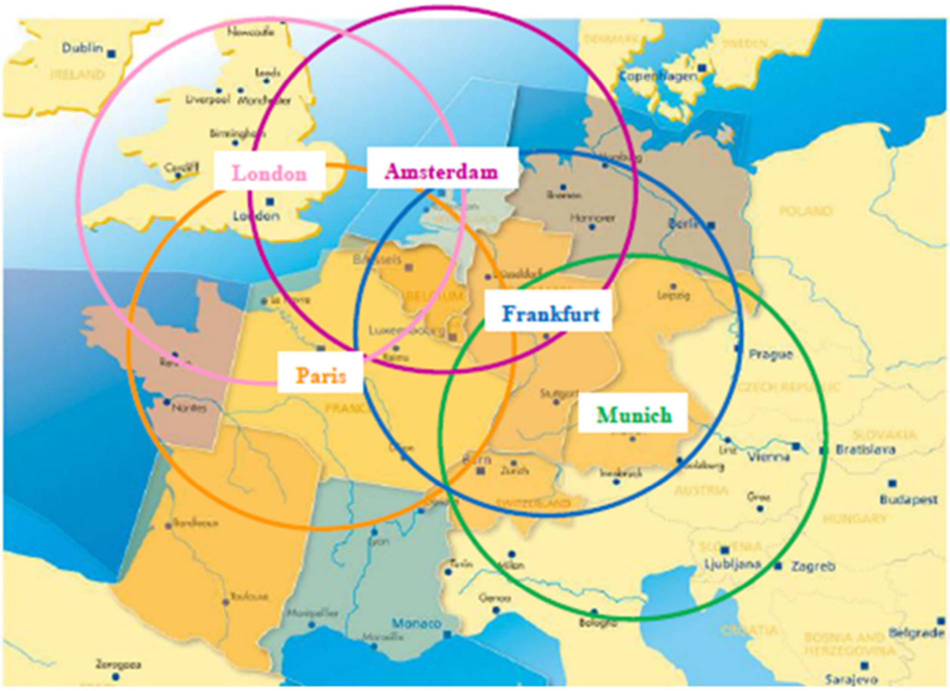


**Figure 4-6: Overlapping AMAN operations**

*As can be seen from Figure 4-5, above described arrival and departure management needs to be implemented as a prerequisite for the future Free Route Airspace strategy. Therefore an accordant FABEC-project was set up in October 2011.*

*4.3.2.2* *X-MAN Contribution to the Environment*

Due to the very first stage of the project no concrete performance assessment of this project was made, but various Studies (FAA, Eurocontrol, NATS, etc.) indicate that there is a potential in fuel saving in the order of 50 -100 kg per flight due to speed control in cruise and/or descent combined with arrival management techniques.

If only 10% of the flights[4] to the 5 major FABEC TMAs were eligible for speed control during the arrival phase, about 6 - 12 Million kg fuel per year could be saved.

*4.3.2.3* *Summary for XMAN*

In order to obtain one number for the estimated results, the average of 6 and 12 Million kg fuel per year is assumed, being 9 Million kg fuel per year. This represents 28,35 Million kg of CO2 per year.

### 4.3.3 Point Merge System

*4.3.3.1* *Description of the initiative*

*Definition of Point Merge*

*Point Merge presents a method to merge arrival flows of aircraft without using heading instructions. The principle is to achieve the aircraft sequence on a point with conventional direct-to instructions, using predefined legs at iso distance to this point for path shortening or stretching. Figure 4-7 shows the necessary route structure in principle.*

*The Eurocontrol Experimental Centre in Bretigny conducted a series of small scale experiments with air traffic controllers to assess benefits and limits of the method.* The *method was found comfortable, safe and accurate, even under high traffic load, although less flexible than today with heading instructions. Predictability was increased, workload and communications were reduced. Even under high traffic load, the inter-aircraft spacing on final was as accurate as today (runway throughput maintained), while descent profiles were improved (continuous descent from flight level 100). As heading instructions were no longer used, aircraft remained on lateral navigation. The flow of traffic was more orderly with a contained and predefined dispersion of trajectories. All these elements should contribute to improving safety.*

[4] 1.2 Million flights per year

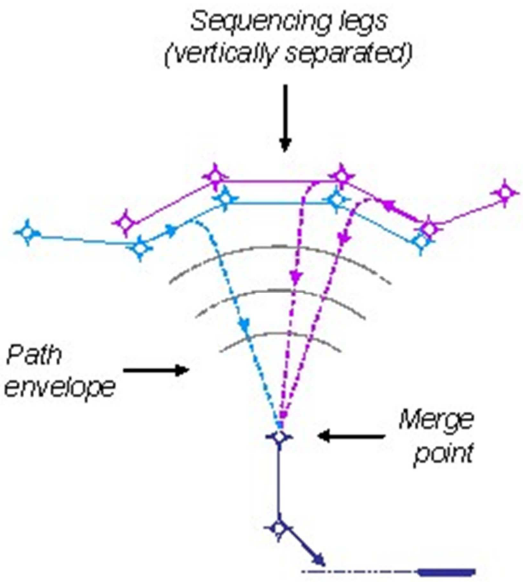


**Figure 4-7:** **Point Merge route structure in principle**

*The Point Merge method is already implemented at the Oslo airport.*

*After CONOPS development in the context of SESAR, the French DSNA set up a project to implement the principle for the approach to Paris Charles-de-Gaulle. This project is called PMS TE (Point Merge System Terminal Extended). As one part of the project, which covers the approach from the North-East, has influence on operations in MUAC and probably Belgocontrol, DSNA asked the FABEC ASB to include this part of the project into the list of FABEC projects. The new proposed route structure at the French-Belgian border is shown in Figure 4-8*

*This also means that Point Merge System Terminal Extended North-East (PMS TE NE) has to be included in the FABEC CBA.*

*At the moment the following phases are considered:*

- Nov 2011/Nov 2012 : CONOPS validation within the framework of SESAR x427
- Nov 2012/Nov 2013 : PMS-TE NE implementation preparation
- Nov 2013 : PMS-TE NE implementation
- Nov 2013/Nov 2014 : PMS-TE NE ASM refinement
- Nov 2014 : PMS-TE NE ASM refinement implementation

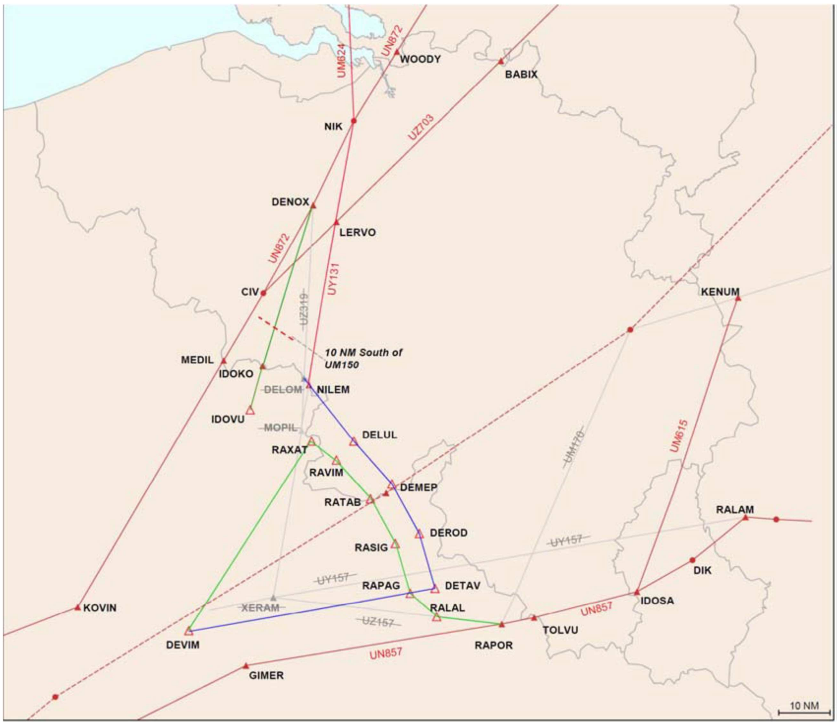


**Figure 4-8: Point Merge System Terminal Extended North-East Overview**

### *4.3.3.2 Contribution to the Environment*

Since the project is in a very early stage, environmental benefits cannot be shown.

# 5 FABEC ENVIRONMENTAL KPIS

## 5.1 *Environment in the FABEC performance plan*

Functional Airspace Blocks and Performance Plans are considered as key elements with regard to the SES goals. In order to support these objectives, enhancing better cooperation between ANSPs and reaching a better collective performance, the FABEC Performance Plan has been jointly established by the six States participating in the FABEC in order to better contribute to the EU performance.

Targets have been set at FABEC level where this was feasible. This was amongst others the case for the Environmental KPA.

In addition to the Environmental KPIs laid down in the EU-SES-scheme, FABEC has defined some additional environmental key performance indicators (with a target) and performance indicators (without a target), as follows:

| EU-wide KPI | FABEC KPI/PI | To Be Developed |
|---|---|---|
| Average horizontal en-route flight efficiency (EC 691/2010) | KPI #1: % of route extension represented in distance flown compared to great circle distance | Effective use of civ/mil airspace structures (EC 691/2010) |
| | KPI #2: Approach procedures in place supporting CDO operations (ICAO Doc 9931) | KPI addressing the specific airport air navigation services (ANS)-related environment issues (EC 691/2010) |
| | PI #1: % of route extension of intra FABEC flights represented by last filed flight plan compared to great circle distance | Continuous Descend Approach (CDA) conformity |

**Table 5-1 : Overview of FABEC environmental KPIs**

The FABEC States believe that the FABEC Performance Plan offers the best possible contribution to the EU-wide targets for the Reference Period 1.

Finally, the FABEC Performance Plan also answers other general objectives of the SES regulation, in particular with a view to get prepared for RP2 and getting closer to a fully operational FAB from 2012 onwards.

## 5.2 *ENV KPI #1 – "Percentage of route extension represented in distance flown compared to the great circle distance"*

The strength of this indicator is the measurement of the actual routes and their extension compared to the great circle distance.

With the definition of this FABEC KPI, FABEC aims to gain better information of the real efficiency pool and to closely monitor the horizontal efficiency of actual routes.

In the context of FABEC projects the horizontal flight efficiency is systematically being assessed, with the overall aim to even more improve the flight efficiency and this to the benefit of the ATM-system and the airspace users.

To drive the ambition for a further improvement of the horizontal flight efficiency, FABEC has set a target of 5% improvement for ENV KPI #1 in 2014, compared to the situation in 2011.

## 5.3 ENV KPI #2: "Approach procedures in place supporting Continuous Descent Operations (CDO) (ICAO Doc 9931)"

FABEC States are not only concerned by the horizontal efficiency, but also aim to provide maximum benefits in vertical efficiency;

One of the most mentioned optimizations in the vertical profile are continuous descent operations.

The ICAO definition of a continuous descent operation is as follows:

> ***"Continuous Descent Operation (CDO).*** *An operation, enabled by airspace design, procedure design and ATC facilitation, in which an arriving aircraft descends continuously, to the greatest possible extent, by employing minimum engine thrust , ideally in a low drag configuration, prior to the final approach fix /final approach point.*
>
> *Note 1.- An optimum CDO starts from the top of descent and uses descent profiles that reduce segments of level flight, noise, fuel burn, emissions and controller/pilot communications, while increasing predictability to pilots and controllers and flight stability.*
>
> *Note 2.- A CDO initiated from the highest possible level in the enroute or arrival phases of flight will achieve the maximum reduction in fuel burn, noise and emissions."*

Therefore FABEC states focus on the introduction of approach procedures that support Continuous Descent Operations.

A shortlist of 23 airports in FABEC States has been identified. For this group of 23 airports a target has been set to bring the number of airports that have published and effective procedures to support Continuous Descent Operation from 10 in April 2010 to 21 by the end of 2014.

## 5.4 ENV PI #1: "Percentage of route extension of intra FABEC flights take-off and landing in the FABEC area of responsibility (AoR)"

Besides to environmental KPIs with targets associated, FABEC States have also identified one environmental PI for reference period 1.

This PI monitors the horizontal flight efficiency for intra FABEC flights and is based on the same definition as the EU KPI on environment and thus is based on the last filed flight plan and not on the actual flown routes as the ENV KPI #1.

By monitoring the currently relatively weak performance figures for the horizontal flight efficiency of intra FABEC flights, FABEC ensures due attention for the evolution of this parameter in the context of improvements of the global network.

# 6 SUMMARY AND CONCLUSIONS

The FABEC IP Environmental case clearly shows that the implementation of FABEC contributes to the reduction in fuel use and $CO_2$-emission. This leads to the conclusion that

**The formal requirement from the Commission regulation (EU) No 176/2011 of 24 February 2011 to show that the FABEC contributes to the reduction of the aviation environmental impact is met.**

Main environmental improvements from FABEC are expected from multiple operational projects. For most of the projects fuel and CO2 reductions were estimated, though some of the numbers, like e.g. for the West project will need updating as the project design evolves and for some projects estimates are not available yet due to the very early stage of the projects.

The table below summarises the results. Based on the best estimates currently available more than 41 Million tons of fuel will be saved, corresponding to more than 132 Million tons of CO2.

| | | Length (NM) | Fuel (ton) | CO2 (ton) |
|---|---|---|---|---|
| Early Implementation Packages | AmRuFra | -438,000 | -3,650 | -11,680 |
| | Night Network | -800,000 | -4,800 | -16,000 |
| | City Pairs | -17,099 | -115 | -360 |
| Airspace Design Projects | Project West* | -186,000 | -2,338 | -7,343 |
| | LUX Project | no info yet due to very early stage of the project | | |
| | SE Project | -1,752,000 | -12,410 | -39,055 |
| | CBALAND/CW Project | no info yet due to very early stage of the project | | |
| Airspace Strategy Projects | Free Route Airspace Project (2013) | -2,289,908 | -18,565 | -58,463 |
| | XMAN | | -9,000 | -28,350 |
| | Point Merge system | no info yet due to very early stage of the project | | |
| ***Totals*** | | ***-5,483,007*** | ***-41,878*** | ***-132,902*** |

**Table 6-1 : Summary of FABEC environmental savings**

FABEC also clearly shows the importance attached to the key performance area of environment, not only by the establishment of a formal ANSP Standing Committee Environment to even better manage environmental aspects in collaboration with a strong performance management team, but also by the provision of a FABEC performance plan that includes FABEC-wide performance indicators and targets for environment, on top of the targets established at EU-level.