



# NEFAB Project Feasibility Study Report Operational Concept

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## 1. INTRODUCTION

The operational concept document is a high level description of the target service concepts described in the Initiative Working Papers for the years 2015 and 2020.

The NEFAB Operational Concept\* provides an overall description of the airspace, service provision and ATM – environment development paths for the declaration of a Functional Airspace Block between Estonia, Finland, Latvia and Norway.

The concept meets with the requirements of the high level European Commission regulations relating to the Single European Sky; namely

- framework regulation 549/2004, as amended in 1070/2009
- service provision regulation 550/2004, as amended in 1070/2009 including the requirements set for Functional Airspace Blocks in Article 9a,
- airspace regulation 551/2004, as amended in 1070/2009 including the elements related to network management and flexible use of airspace,
- interoperability regulation 552/2004, as amended in 1070/2009, regarding the constituent parts of the EATMN air navigation system infrastructure.

The Operational Concept can be further developed to gradually encompass the different elements of the SESAR ATM Target Concept and its Concept of Operations, which represents a paradigm shift from an airspace-based environment to trajectory and performance based environments.

The development of the NEFAB Concept of Operations\*\* will aim towards an evolutionary process, taking full advantage of existing and newly developed technologies and taking into account the SESAR roadmap including the relevant Capability levels and Service Levels\*\*\*. as well as the Future ATM Concept of Operations for the North Atlantic Region. The Concept of Operations should be adaptable to the operational environment and scalable to meet the specific needs of the FAB.

*\*Operational Concept – A high level description of a set of defined ATM components and the manner in which they are organised and operated, which meet a given set of high level user requirements.*

*Comment – The Operational Concept is neither a description of the air navigation infrastructure, nor a technical system description nor a detailed description of how a particular functionality or technology could be used.*

*\*\* Concept of operation is a detailed description of how an operational concept is applied. It identifies the functions and processes, and their corresponding interactions and information flows; concerned actors, their roles and responsibilities.*

*\*\*\* The concept of ATM Service and Capability Levels is used as the top-level, system-wide basis to identify the performance characteristics, by which all components of the future European ATM system will be linked. A level of performance is provided at each ATM Service Level with higher performance provided at each successive Service Level.*

The Operational Concept is a core element in the establishment of NEFAB and is a core driver in reaching the performance targets in the areas of safety, capacity, cost effectiveness, flight efficiency, mission effectiveness and environment. The NEFAB region will be considered to be one continuum of airspace with seamless transitions between the ATS–units. The concept will contribute to meeting the needs of the airspace users by delivering enhancements in flight efficiency, military mission effectiveness and capacity in a safe, environmentally sustainable and cost-effective manner for all airspace users and service providers.

The elements of the Operational Concept are interrelated. The concept represents major changes from today's environment and takes advantage of joint efforts in a FAB context to provide a comprehensive service and accommodate all stakeholders.

In the context of the NEFAB Feasibility Study the envisaged Operational Concept has been developed around four main elements:

1. Airspace Design;
  - ATS Routes and Free Routes
  - Sectorisation
  - Airspace classification and delineation
  - Military Areas/Flexible Use of Airspace structures
2. Air Traffic Services (ATS);
  - Demand and capacity management
  - Sector Configuration Management (SCM)
  - Trajectory and conflict management
  - Operational rules and procedures
3. Airspace Management (ASM)/Air Traffic Flow and Capacity Management (ATFCM);
  - Strategic
  - Pre-tactical
  - Tactical
4. Enablers.
  - Regulatory framework
  - Training
  - Functionality and interoperability of systems
  - Common information management
  - AIM

Three scenarios have been developed in the NEFAB Feasibility study where the 2015 vision should be regarded as a common milestone towards an optional Minimum or Performance scenario for 2020. The NEFAB Operational Concept reflects these migration options in relation to implementation timelines and ambition levels within each of the concept elements.

## 2. AIRSPACE DESIGN

### 2.1 *ATS Routes and Free Routes*

A key to the SESAR ATM target Concept is the “Business/Mission Trajectory” principle, in which the airspace users and ANSPs define together, through a collaborative process, the optimal flight path. The NEFAB Operational concept supports this migration from an airspace based environment to a trajectory based environment with a stepwise implementation of Free Route Airspace in NEFAB, while ensuring Route network connectivity to third states/neighbouring FABs, lower airspace and TMAs as well as enabling the execution of military training objectives. This will provide for a substantial increase in trajectory selection options for the airspace users, reducing the average route extension and flight time resulting in a reduction in fuel burn and reduced environmental impact. In areas where fixed routes are retained (e.g. in TMAs, at lower levels or until FRA is implemented), the network will be enhanced, taking advantage of an airspace unconstrained by national borders and FIR boundaries and the implementation of Performance Based Navigation.

### 2.2 *Sectorisation*

ATC sectors will be designed to support the optimised traffic flows based on the principles stated in 2.1, unconstrained by national borders and/or FIR/UIR boundaries. This will reduce the complexity in the operations, reduce controller workload and increase the airspace capacity. Cross-border sectorisation is established as a principle instead of delegation of ATS.

The airspace structures around major hubs will be designed to cater for cross-border feeder/stacker and TMA sectors, allow sufficient time for traffic anticipation and facilitate traffic sequencing pre-departure and prior to top-of-descent, Continuous Descent Approaches (CDAs) and Continuous Climb Departures (CCD).

The implementation of an optimised sectorisation will need to be made in steps to create quick-wins, reduce risks and make the changes manageable. In the first step the existing sectors will be realigned to support the improved ATS route network/Free Route traffic flows in a static cross border sectorisation scheme, as well to enhance capacity. The airspace adjacent to NEFAB will also have to be taken into account for optimal network solutions.

A conceptual change regarding sector design and allocation principles for the continental NEFAB area is foreseen for the later steps, where sectors are constructed from air blocks to enable dynamic sector configuration management. Terminal Airspace System (cross-border) concept with associated feeder/stacker sectors may also be applied.

En-route sectors and sector groups will be designed to provide the capacity needed to accommodate the forecasted traffic growth, support the main traffic flows and potential conflict areas, support feeder/stacker functionality and accommodate the

differing traffic environment in the NEFAB area. The sectors will be designed taking into account their interaction and homogeneity, also considering the different challenges and opportunities in the high density, low density and oceanic areas. The dynamic sector configuration management functionality will place substantial requirements on system support as well as ATS provision rules and procedures, including the regulatory aspects.

### *2.3 Airspace Classification and Delineation*

A further harmonisation of airspace classifications below FL 195 will facilitate cross-border sectorisation by avoiding complexities involved with applying different rules and procedures. A common application and access rules of class C airspace above FL95 in continental en-route airspace is envisaged already for 2015. Further harmonisation of airspace classification below FL95 is regarded as beneficial for a scenario involving conceptual changes of the sector design.

The division into upper and lower airspace has a historic background and the operational need for such a division has disappeared, especially with the harmonisation of airspace classification. In operational terms the continued division into upper and lower airspace creates difficulties due to potential discontinuances between route segments across states and/or FABs. A removal of the division level between upper and lower airspace is therefore considered beneficial. As airspace classification and delineation is to a large degree a regulatory issue, a strong dependency exists between this improvement area and NSA collaboration.

### *2.4 Military Areas/FUA Structures*

To achieve optimum use of airspace military areas, the associated management procedures will need to be designed in a way which integrates the areas of reserved airspace to the network to a high degree and enables flexible network management. This design shall take into account the Free Route applications as well as the fixed ATS route network. Military areas will be realigned, where feasible, by increasing their modularity, to allow increased flexibility in their pre-tactical and tactical use. FUA structure application in the envisaged 2020 operational environment, places requirements on the system-wide information sharing, as well as centralised FAB-wide network management function.

### *2.5 Airspace Design enablers, requirements and timelines*

ATS route enhancements to continue – where required – up to 2020, with main efforts focused on FRA implementation as of 2015. FRA implementation FL285+ is envisaged as of 2015, FL245+ for the 2020 minimum scenario and FL195+ in the 2020 performance scenario.

Improved static cross border sectors replacing the current application of ATS delegation in specific areas is expected to be in place by 2015. Dynamic cross-border sectors are to be implemented in 2020 where required. Regulatory framework



and system support is required to be established to enable advanced cross border operations.

Airspace classification, including the appropriate access rules, harmonisation (FL95 – FL195) and removal of the division flight level between upper and lower airspace is expected to be implemented by 2015. Airspace classification harmonisation below FL95, including the appropriate access rules, is expected to be implemented by 2020 according to common regulatory requirements.

Enhanced FUA structures to accommodate the network functionality and military mission requirements in support of the route network and sector design will be implemented in 2015. FUA structures required to support the FAB-wide Free Route application and dynamic cross border functionality to be implemented in 2020. Common FUA application on all ASM levels as well as common system support is required to manage the envisaged ASM environment.

### **3. AIR TRAFFIC SERVICES**

#### ***3.1 Capacity Provision and Resource Management***

To enable the service provision in an operational environment such as described in section 2, the procedures related to ATS provision in a dynamic cross border environment will be optimised. Sector manning principles are based on the efficient use of available resources through the implementation of concepts such as multi sector planner and cross border multi sector planner where applicable. Cross-border ATS provision will be based on a new regulatory framework and licensing scheme enabling service provision within a sector group, which delivers the required capacity in a cost-effective manner for both peak and off-peak traffic flows. Resource planning is based on a FAB-wide HR-plan and common ATS/ASM/ATFCM planning on FAB level.

#### ***3.2 Sector Configuration Management***

Sector configuration management will be based on ATFCM procedures developed for the appropriate airspace solution and demand-capacity balancing requirements. In the first phase the configuration management procedures will be applied mostly on the local level based on the common strategic planning performed within the scope of ASM/ATFCM improvements. In the second phase the configuration management principles are extended to include the elements required to support the dynamic cross-border operations in a FAB-wide Free Route environment.

Following the implementation of an identical ATM-system for Finavia and EANS, the common platform can be used to develop and validate cross border sector configurations procedures ahead of the foreseen FAB-wide (as well as SESAR) schedule. This would also benefit the capacity provisions and resource management targets described in 3.1 above.

#### ***3.3 Trajectory and Conflict Management***

Trajectory and conflict management in the envisaged environment is enabled through the use of enhanced ATM technologies, such as real time cross border flight data and trajectory sharing capabilities, harmonised data link services (including DL – infrastructure, message sets and associated procedures) together with AMAN/DMAN functionalities for the major hubs and PBN/RNP solutions, which will enable the efficient design and use of the airspace. Controller tools and safety nets as being developed within the Eurocontrol FASTI program will be deployed in a harmonised way to ensure the safety of operations, as well as a common set of parameters and operational procedures.

Trajectory management based shared FDP-data would enable real time trajectory updates in all affected sectors, reducing the need for verbal coordination and manual FPL-processing. Realtime trajectory updates are essential in cross border Free

Route environment to ensure precise trajectory data exchange and conflict management between affected units.

### *3.4 Operational Rules and Procedures*

The provision of ATS within NEFAB is based on a common set of rules and procedures (level 1, 2 and 3) to enable service provision in the envisaged Free Route and cross-border environment. Operational procedures at the interfaces within NEFAB will be uniform and transparent. The development of NEFAB rules and procedures evolves from the initial coordination of operational rules and procedures to the publication and production of a common set of NEFAB rules and procedures by a centralised unit. All manuals, handbooks and other related material will be developed in English.

### *3.5 ATS contingency*

Paragraph 5.4 of Attachment C to Annex 11 to the Chicago Convention recommends that in the case of multi-state developments, detailed coordination leading to formal agreement of the contingency plan should be undertaken between the states. Similar coordination should also be undertaken with those states whose services will be significantly affected, and with international organisations concerned. Article 5.4 of EC regulation No 551/2004 provides that a FAB shall only be established by mutual agreement between the states. The EC legislation does not contain any explicit provisions on the specific case of contingency in FABs. In both cases, a written agreement between the states concerned shall contain provisions on contingency.

NEFAB ATS–contingency concept shall be incorporated in the ATS–scenario development and it will also define the scope of the contingency scenarios, e.g. whether the scenario includes the provision for “service continuity” or limits provision to “fail to safe” modes of operation.

### *3.6 ATS enablers, requirements and timelines*

An interoperable ATM – system infrastructure is required as the baseline for ATS provision optimization. Level 1 and 2 ATS procedures will be harmonised before common operational rules and procedures are implemented. Operational rules and procedures are common for the NEFAB area and developed by a common unit by 2015. All handbooks are in English. Training and competency requirements will be developed in parallel with the service provision development in the states to ensure the viability of common ATS – procedures.

ATS provision principles for FRA FL285+ with static cross border sectors, using multi sector planners where feasible, will be implemented in 2015. A dynamic cross-border environment, using cross-border multi sector planners where feasible and with



associated licensing schemes and peak/off-peak scenarios for service provision, will be implemented in 2020.

Sector configuration management procedures for static cross border sectorisation supported where needed by multi sector planners are implemented in 2015. Procedures for dynamic cross border sectorisation to support the airspace design and demand-capacity balancing scenarios are implemented in 2020.

A trajectory and conflict management functionality is required to support the static cross-border scenario in 2015. Enhanced system support is required for the dynamic sectorisation scenario for 2020.

## **4. ASM/ATFCM**

### *4.1 Strategic ASM/ATFCM*

Following the functional integration of the ASM/ATFCM processes on a national level, common strategic ASM/ATFCM CDM processes will be established. This strategic phase of ASM/ATFCM activities will be managed by a virtually or physically centralised planning function. ASM/ATFCM procedures for modular training area management in FRA/cross-border environment will be developed.

### *4.2 Pre-tactical ASM/ATFCM*

Pre-tactical ASM/ATFCM functions will be virtually or physically centralised in the medium term, leaving only the tactical management for local AMS/ATFCM units. FUA application in the NEFAB area will be harmonised to enable the network management function to collect, process and distribute airspace use related data. CDM processes are enhanced to allow moving the pre-tactical phase closer to the commencement of operations.

### *4.3 Tactical ASM/ATFCM*

Tactical ASM/ATFCM procedures will be incorporated into the operations of the FAB network management unit on the medium to long term. Local units will be able to apply ad hoc ASM/ATFCM measures as required, but during normal operations ASM/ATFCM procedures are managed by the centralised network management unit in coordination with the regional network manager (EUROCONTROL) as well as the local units. ASM/ATFCM procedures for dynamic cross-border sector configuration management are developed. Real time airspace data and flight trajectories are shared with all airspace users.

There is a need to maintain local focal points being able to take ad-hoc tactical decisions. Decision making requires thorough and detailed expert knowledge of the local environment to ensure a decision making process that supports the actual operation. The regional network effect of local decisions will be assessed by the centralised ASM/ATFCM unit.

### *4.4 ASM/ATFCM enablers, requirements and timelines*

Any agreements and proposed improvements regarding ASM/ATFCM-processes within NEFAB will ensure that the sovereignty and the right of access to airspace of

all states are maintained. The initiative will also take into account the differences in the operational environment and airspace users' needs, i.e. the specific national air force and NATO operations related requirements.

Optimum airspace solution with appropriate system support is required in order to be able to implement the enhanced ASM/ATFCM provision model.

Common system support is required to manage the ASM/ATFCM processes.

Level 1 and 2 rules and procedures will need to be harmonised before common operational procedures (Level 3) can be implemented.

Strategic ASM/ATFCM procedures and a centralised function will be implemented by 2015.

Pre-tactical ASM/ATFCM procedures managed by the centralised function will be implemented as an interim step in 2017.

Tactical ASM/ATFCM procedures managed by the centralised function will be implemented in 2020.

## 5. ENABLERS / PREREQUISITES

### 5.1 *Regulatory Framework*

A regulatory framework is required to enable both the design and implementation of cross border airspace solutions encompassing ATS routes, Free Route Airspace, Flexible Use of Airspace and sectorisation.

The regulatory framework must support the centralisation of ASM/ATFCM functions and dynamic sector configuration management.

The regulatory framework must enable cross-border service provision through a common licensing scheme, harmonised safety oversight mechanisms and common operational rules and procedures.

### 5.2 *Safety Management System*

The NEFAB SMS (Safety Management System) initiative is based on establishing common SMS principles, targets and to align the main SMS processes. The goal is to manage the SMS elements in a more effective way, using best practises and to be able to exchange data for analyses in order to facilitate improvements in the common ATM–environment. The integration of the SMS processes will be performed in several stages. This will enable the establishment of an effective change management process within NEFAB to manage and oversee the changed proposed within the initiatives.

### 5.3 *Stakeholder considerations*

The national sovereignty of each participating state will be guaranteed also during cross border operations. Specific military requirements with respect to national borders will be respected also with regard to cross border operations. Common procedures shall guarantee current level of freedom of operations for the military operators. Due to reasons of national security and sovereignty the cross border operations may be discontinued and procedures for the temporary or permanent discontinuation of the cross border operations will be agreed on state level.

During the NEFAB development phase stakeholder consultations will be conducted as part of the project management activities described in the development plan. The consultation process will be agreed between the NSAs and the ANSPs and will include both informal information sharing as well as requests for formal statements. Consultations will be conducted with the airline operators, military operators, general aviation associations, trade unions and third states, as required.

## *5.4 Environmental considerations*

Environmental (emissions, noise, and fuel savings) impact of proposed changes will be assessed during the NEFAB development. The main contributors to reducing the environmental impact are the implementation of free route airspace and the associated modular training areas, enhanced CDM-processes enabling better network predictability and enhanced pre-tactical planning as well as enabling increased CCD/CDA utilisation. The environmental effect of ATS-route implementations, including the Free Route concept, will be analysed in the development phase. The effect of the Emissions Trading Scheme as of 2012 will be evaluated at a later stage as its effect on the traffic flows is not known at the moment.

## *5.5 Training and competency*

Common training requirements for regional network management functions are needed. Training requirements also encompass the military aspects.

Cross-border service provision must be supported by common requirements related to training and competency.

## *5.6 Functionality and Interoperability of Systems*

Sufficient system support is needed to implement the different airspace design scenarios.

System support is required for regional sector configuration management.

Common airspace management tools are required for centralised ASM/ATFCM functions.

## *5.7 Common Information Management*

Information sharing supporting ATS, ASM/ATFCM and AIM will be based on a SWIM-concept.



## 5.8 AIM

Harmonisation of AIS/AIM, in order to achieve a common interface for customers, providing the same services throughout the NEFAB area will enable more cost efficient operations through the reduced use of staff resources, reduction of system costs and reduced duplication of tasks.

It is oriented for the increased use of computer technologies in the management of aeronautical information, with an increased emphasis on the digital form of data that will drive all processes for the management of information.