LARA
Local And Regional Airspace Management
Supporting System
Conceptual Description

Reference: DCMAC/HS/DEL/08-015  Status: Released  Edition No: 2.0  Date: 11 November 2008

LARA Programme Manager  Patrick DELMOUZÉE
Head of DCMAC/HS  Michael STEINFURTH
Director DCMAC  Jean Robert CAZARRÉ
DOCUMENT CONTROL

Copyright notice

© 2008 European Organisation for the Safety of Air Navigation (EUROCONTROL). All rights reserved. Member States of the Organisation are entitled to use and reproduce this document for internal and non-commercial purpose under their vested tasks. Any disclosure to third parties shall be subject to prior written permission of EUROCONTROL.

Edition history

<table>
<thead>
<tr>
<th>Edition N°</th>
<th>Date and Status</th>
<th>Author(s)</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>12/06/08</td>
<td>F. CERVO, P. DELMOUZÉE</td>
<td>Creation</td>
</tr>
<tr>
<td>2.0</td>
<td>11/11/08</td>
<td>F. CERVO</td>
<td>Addition Annex F</td>
</tr>
</tbody>
</table>

Acknowledgements

<table>
<thead>
<tr>
<th>Name</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Filename and Path

P:\DCMAC\Library\Deliverables\DCMAC_HS deliverables\DCMAC_HS_DEL_08_015 LARA Conceptual Description ed1_1 111108.doc
# TABLE OF CONTENTS

EXECUTIVE SUMMARY ...............................................................................................................................................1

1. INTRODUCTION .......................................................................................................................................................2
  1.1 Background and Rationale ........................................................................................................................................2
  1.2 Current Situation ....................................................................................................................................................2
  1.3 Improvement Path ..................................................................................................................................................3
  1.4 Objectives .............................................................................................................................................................4
  1.5 Benefits .................................................................................................................................................................5
  1.6 Terminology ..........................................................................................................................................................5

2. CONCEPTUAL DESCRIPTION .....................................................................................................................................7
  2.1 Vision .................................................................................................................................................................7
  2.2 General Description ..............................................................................................................................................7
  2.3 Principles .............................................................................................................................................................8
  2.4 ASM Organisation and Involved Roles ................................................................................................................9
    2.4.1 General View ................................................................................................................................................9
    2.4.2 Network Level View ....................................................................................................................................10
    2.4.3 State Level View ..........................................................................................................................................11

2.5 Stakeholder Requirements ....................................................................................................................................12
  2.5.1 Civil USEF Requirements ............................................................................................................................12
  2.5.2 Military USEF Requirements .........................................................................................................................12
  2.5.3 CUF Requirements .......................................................................................................................................12
  2.5.4 Civil ANSP Requirements ............................................................................................................................12
  2.5.5 MAPF Requirements .....................................................................................................................................13
  2.5.6 CAPF Requirements .....................................................................................................................................13
  2.5.7 AMCF Requirements .....................................................................................................................................13
  2.5.8 NETF Requirements .....................................................................................................................................13
3. PROCESS DESCRIPTION .............................................................................................. 14

3.1 Module 1 Airspace Planning ............................................................................... 14
   3.1.1 Purpose ........................................................................................................... 14
   3.1.2 Process ........................................................................................................... 14
   3.1.3 Event Calendar (EVC) ................................................................................... 15
   3.1.4 Long-Term Planning (LTP) .......................................................................... 15
   3.1.5 Short-Term Planning (STP) .......................................................................... 16
   3.1.6 Day Planning (DP) ....................................................................................... 16
   3.1.7 Tactical ......................................................................................................... 16

3.2 Module 2 Airspace Status .................................................................................. 17
   3.2.1 Purpose ........................................................................................................... 17
   3.2.2 Process ........................................................................................................... 17
   3.2.3 Functional Requirements ............................................................................. 17

3.3 Module 3 ASM Data Collection for Performance Measurement ..................... 18
   3.3.1 Purpose ........................................................................................................... 18
   3.3.2 Process and Principle ................................................................................... 18

4. CONCLUSIONS ...................................................................................................... 20

Annex A: Glossary of Terms
Annex B: Reference Documents
Annex C: EC Regulation 2150/2005 (FUA) Analysis
Annex D: National ASM Supporting Systems
Annex E: ASM Support System Requirements for Civilian ANSPs
Annex F: Compliance With Interoperability Regulation
EXECUTIVE SUMMARY

Current figures in ATM are showing a steady growth in air traffic and airspace demand which calls for more efficiency and transparency in airspace management. Today, the Single European Sky initiative, the enhanced Flexible Use of Airspace (FUA) concept and associated concepts are paving the way for medium and long-term performance enhancements in ATM. In this context, short-term performance improvements in airspace management such as supporting systems for planning and cooperative decision-making should be considered as key enablers for the implementation of current and future concepts.

The following document aims at presenting a conceptual description for an ASM supporting system at local and regional level taking benefit of already existing systems at State level. Such a system would be complementary to the network ASM support systems and existing local and national systems.

The main overall objectives are to:

- Support local and regional airspace management and the coordination process up to the network level;
- Enable the improvement of the coordination process between the network and the local and regional levels;
- Technically support network airspace management by interfacing with CFMU and local airspace managers;
- Provide easy access to the correct airspace status information;
- Collect and prepare statistical data on ASM for performance measurement.

This activity fits in the DMEAN FP timeframe and is the first part of a twofold approach. The second part focuses on the development of a demonstrator aiming at validating the concept. The activity has also been identified as a work package in the Agency ASM Improvement Action Plan.
1. INTRODUCTION

1.1 Background and Rationale
The world of air transport is evolving rapidly. A steady growth of air traffic is expected whilst the liberalisation of the market is causing a changing character of air transport in Europe.

ATM activity might therefore show important growth while in essence the nature of the military activities will remain unchanged within the next years, except to a certain extent for UAS (Unmanned Aerial Systems). There is a trend to reduce the military fleet; however, the introduction of new weapons systems will require access to larger volumes of airspace.

One of the major challenges to overcome is to improve airspace management and capacity and demand management, mainly by implementing more dynamic and flexible airspace structures and a more efficient and transparent decision-making process.

The Single European Sky (SES) implementation rules aim at improving the performance of the pan-European ATM network to fulfil the expectations of the stakeholders and especially at making the network more dynamic. Commission Regulation (EC) No 2150/2005 lays down common rules for the flexible use of airspace. Some articles of this regulation state or suggest the need for supporting systems at Member State level (see analysis in Annex C). The SES initiative is promoting a major reorganisation of airspace with the goal to create Functional Airspace Blocks (FAB). Stakeholders also identified the need of national and regional ASM support systems in their FAB feasibility studies.

One of the programmes for enhanced operations in Europe is the EUROCONTROL DMEAN (Dynamic Management of European Airspace Network) Framework Programme. A leading concept in this programme is FUA in which the management and dynamics of allocation of airspace is established. The enhanced FUA concept integrates airspace capacity management, demand management and the process of decision-making, balancing capacity and demand.

This requires the combination and extension of present-day functions for airspace management and flow management and the establishment of a new positioning of these functions within a wider regional context. The concept assumes the operation with well-defined interoperability between service providers, military units, neighbouring organisations and the European network. Additional continuous consultation and transparency is inevitable.

In this perspective, the development of appropriate State airspace management supporting systems could drastically improve processes by providing mutual visibility on civil and military requirements, by increasing mutual understanding and by enabling a more efficient collaborative decision-making process.

1.2 Current Situation
To support the enhancements, DMEAN identified the need for technical support systems. However, up until presently, the main effort was concentrated on the network part. The CFMU system optimisation has been planned and is ongoing. In most cases, system support at national or regional level has not evolved, creating a technical unbalance between network managers at CFMU level and Member State airspace managers, which could jeopardise pursued dynamic cooperative decision-making and data sharing.

In addition, the Agency ASM Improvement Action Plan, specifically in its WP 8.1, promotes the development of systems to support planning activities.
Some Member States have quite naturally implemented their own ASM supporting systems. This has led to the existence of a number of disparate systems all of which have some excellent characteristics, but none of which have all desired functionalities or which could be applied universally to all Member States. For information, a table in Annex E shows the ASM supporting systems implemented or under development in Core Area Member States.

This fragmented approach affects interoperability and general network performance. Projects have taken these aspects into consideration during their design phase; meanwhile, no interoperable systems will be available in the near future.

1.3 Improvement Path

Closer co-operation between Member States (from both civil and military perspectives) and the use of ASM support systems are key to developing Europe-wide ASM, in particular cross border cooperation.

Additionally, it has also been clearly highlighted that flight safety in such an evolving and dynamic environment can only be maintained and enhanced by sharing the airspace status and the current traffic situation with all concerned partners in one (block of) airspace.

Optimisation of the airspace use and performance call for extensive analysis of the historic data. Dedicated projects (e.g. PRISMIL) and the development of civil and military KPIs will without any doubt improve the situation. However, no standards are in place for the collection of data. Harmonisation or standardisation will facilitate the use of the analysis systems.

Since expectations are that ASM coordination might increase the workload of the involved stakeholders, automation of existing tasks in a multi-stakeholder network perspective is key.

Future initiatives to enhance FUA would be possible if States and ANSPs decide to concertedly develop ASM supporting systems for national and regional needs based on common specifications.

EUROCONTROL, as a civil-military ATM organisation, has taken the initiative to draft the conceptual description and operational specifications of such a system, with the support of its civil and military stakeholders.

Within this context, this conceptual description of a support system aims at providing a migration path from a fragmented situation of ASM supporting systems for FUA level 2 and level 3 towards a more harmonised, interoperable and efficient system. A description based on existing national solutions, and promoting modular options, will facilitate integration at network level. A stepped approach including the development of a demonstrator shall enable the refining of the operational description as well as the detailed functional specifications.

A harmonised national or regional ASM support system meeting the operational requirements of stakeholders, complementary to the network support system, would be a major enhancement for overall ASM performance.
1.4 Objectives
A civil-military Airspace Management Supporting System at local or regional level should:

- Meet the requirements expressed in Commission Regulation (EC) No 2150/2005 laying down common rules for the flexible use of airspace. (see Annex C);
- Support civil-military data sharing and collaborative management;
- Support common civil-military situational awareness;
- Contribute to the improvement of the airspace planning process and to demand/capacity balancing.

In particular, it should address the following:

- Safety enhancement by providing to all involved stakeholders a common and correct airspace status based on responsible management of data;
- Management of airspace requests issued by military and civil airspace users at pre-tactical and tactical levels;
- Alignment, balancing and integration of airspace requests in a civil-military national and regional traffic environment;
- Provision to all involved stakeholders at national and regional levels of current validated national airspace planning;
- Provision to CFMU or other agencies of coordinated civil-military traffic/airspace planning at agreed times;
- Facilitation of access to simulation options at local and regional levels for “what if” scenarios, to support the elaboration of the best balanced airspace planning;
- Processing of network advise based on network assessment;
- Provision of necessary data to enable efficient cooperative decision-making at national level;
- Collection of necessary data to support civil and military KPIs;
- Automation of manual tasks (e.g. provision of NOP input);
- Provision of data exchange (harmonised data format and interfaces) with other systems (network and national).

The following specific objectives are to be met for the military community:

- Efficient airspace management of required airspace as close to the operation time as possible to enhance mission effectiveness;
- Support of the entire airspace planning process including acceptance by higher hierarchic levels and corrective measures from the initial airspace request up to mission completion and airspace vacation;
- Support to planning of military cross-border operations;
- Transparency towards civilian partners;
- Confidentiality as required;
- Flexibility for the execution of operations and training.

The following specific objectives are to be met for the civil community:

- Optimisation of network utilisation (capacity, flight efficiency,....);
- Support airspace requests at tactical level;
- Preparation of the adequate CDR activation plan to be included into the airspace planning;
- Complement the network system;
- Transparency towards military partners.
1.5 Benefits

The conceptual description of a local and regional ASM support system and associated specifications concertedly drafted by a majority of stakeholders will assure a harmonised approach. Easier conformity of the systems to the specifications is ensured when basing the work on existing best practices.

It is expected to enable a more dynamic and flexible airspace usage. Standardised stored data to be used for civil and military KPIs would provide more transparency between civil-military activities and improve analysis processes and performance assessments. It should help enhance national ASM procedures and offer the opportunity to develop regional management.

Flight safety will be ensured and sponsored by sharing of the airspace status.

Implementation of specifications within a system or dedicated software is expected to bring the following benefits:

- Consolidating flight safety through accurate and trustworthy airspace status data sharing;
- Optimisation of airspace management tasks and workload reduction through automation;
- Enhancement of civil-military ASM coordination at levels 2 and 3;
- Easier and more accurate national ASM planning;
- Provide customised support functions for the airspace management process at all levels;
- Assure continuity between the national/regional process and the network process;
- Enable the continuity of cooperative decision-making and coordinated optimisation of ASM from the earliest stage of airspace planning until operation time;
- Harmonised approach to deliver accurate and up-to-date ASM data to international agencies;
- A more harmonised interface with network systems and other systems;
- Harmonisation and automation of data required for statistic analyses;
- Facilitate the implementation of cross-border operations and ultimately, the establishment and operation of Functional Airspace Blocks (FAB).

1.6 Terminology

This section will expound on the terms used in the present document so as to limit to the largest extent possible ambiguous terminology which could lead to confusion or misinterpretation.

- **Airspace management**
  A planning function with the primary objective of maximising the utilisation of available airspace by dynamic time-sharing and, at times, the segregation of airspace among various categories of airspace users on the basis of short-term requirements.

---

1 Regulation (EC) No 549/2004 of 10 March 2004: The framework Regulation
• Airspace planning
  Includes all activities such as booking, analysis, simulation coordination, and allocation needed to define a plan for the efficient use of the airspace. The responsibility of these activities rests with the airspace management functions (FUA level 2).

• Airspace status:
  A consolidated temporary agreement concerning the organisation for use of the airspace during the tactical phase (FUA level 3). The responsibility for adaptations to this organisation lies with the responsible controlling agencies.

• Availability or unavailability
  CDRs are available or unavailable for use. Segregated airspace means that the airspace is unavailable to other traffic than foreseen in the area. To avoid confusion the ‘availability’ should be qualified by identifying to whom the availability applies. It is perfectly feasible to have an area available to the military and simultaneously have the CDR associated with the area available for civil use.

• Active or inactive
  Takes into account the activity for which an area is being used. When planned users are occupying an area, it is active. For areas planned to be used on short-term, the term “pre-active” is used.

• A role or function and system function
  A role or function will be used to define the responsibilities of a person in the ASM process, whereas a system function will be used to describe what a system has to do.

---

2 The transition from airspace planning to airspace status is based on a time parameter which is decided at ASM level 1
2. CONCEPTUAL DESCRIPTION

2.1 Vision

To define a modular ASM support system based on operational best practices and harmonised requirements with the necessary interfaces, to facilitate a network collaborative decision-making process among stakeholders in the perspective of enabling future ASM concepts.

2.2 General Description

An ASM supporting system shall support the FUA and enhanced FUA concept, dynamic ASM, cross-border operations (CBO) and de-centralised or centralised airspace management at state level and at regional level (such as Functional Airspace Blocks).

It shall be customer-oriented with an efficient link between airspace users, service providers and airspace managers. A key aspect is the real-time presentation of the same data to all roles.

It will also be able to support the ASM procedures and organisation of the different States.

An open architecture shall guarantee its interface with existing and future systems.

It shall support the airspace planning cycle as early in the process as possible, and automate recurrent tasks to a further extent.

The system should assure common, secure and consolidated information exchange of the current airspace status. Data exchange with existing ATC systems should be offered as a choice to stakeholders.

All data within the system should be retained and be available for performance analysis purposes. Transparency should be one of the main drivers for the system.

Three distinctive areas in airspace management need to be supported. A unique system based on a modular approach is preferred to three separate systems to guarantee transparency for potential users. With a modular approach it should become possible to connect existing systems as a module.

Module 1 Airspace planning (PLA)

This module shall support airspace booking or reservation, analyses, civil-military planning co-ordination, simulations, collaborative decision-making, AMC decision-making, cross-border coordination, information promulgation and airspace allocation mainly based on national or FAB harmonised procedures.

Module 2 Airspace status (STA)

This module shall support level 3 management of airspace including short-term cancelation and additional change or allocation of airspace. It shall be capable of interfacing with ATC systems. Data integrity is a major flight safety concern.

Module 3 Airspace Management Data Collection for Performance Measurement (DAT)

This module shall collect in a harmonised way the data of modules 1 and 2. It shall be capable of interfacing with data analysis programmes.

Stakeholder requirements are paramount and have been identified at the end of Chapter 2 since they are grouped by generically described ASM roles defined in Chapter 2.4.
2.3 Principles

**Safety:** Users shall always have access to the correct information to ensure flight safety.

**Performance:** The hardware used must allow to process messages and data in practical real-time.

**Interoperability:** As a key enabler shall be sought to foster information exchange, the latest communication standards shall be incorporated. The system shall comply with SES interoperability regulation and the related implementing rules.

**Integrity and confidentiality:** Due to the impact on flight safety of certain functions, data integrity shall be guaranteed at all times. An acknowledgement for all input influencing the status of the airspace and controlled access to authorised functions should guarantee the data integrity. External verification with other systems is not foreseen.

**Back up and recovery:** As the system should work on any station, each user should be able to make a back-up whenever a hardware problem should occur. In case of a network failure, a back-up procedure per telephone and/or fax shall be foreseen. Software crashes should be processed by local technicians of the customer, possibly with a help line.

**Flexibility:** As the programme should work on each modern station, and access can be obtained via a password, functions should make the system a flexible instrument which supports deployments. It should allow for compliance with requirements from civil and military users, with their customised display.

**Responsible management of information:** The use of the system must be laid down in clear agreements which specify those responsible for the correctness of the data exchanged between partners and which are used to make operational decisions. The status of the data should be transparent.

**User-friendliness:** The difference between a successful system and a failure greatly depends upon user-friendliness. Special attention should be drawn on this aspect and on customisation possibilities.

**Sustainability/Maintenance:** Since the structure, parameters and airspace management rules are different and may change, the development shall take into account that changes can be adapted swiftly and easily. Changes should not imply changes of stored procedures, database or programme codes.

**Other:** The functions and concepts of existing systems (e.g. AMP II; Stanly/MVPA) will be incorporated within the specifications when appropriate. The system should allow possible extension (open architecture).
2.4 ASM Organisation and Involved Roles

2.4.1 General View

The figure above represents the overall ASM/ATFCM layout at network and national levels. It generically describes the scope addressed by the Network ASM support system and the National ASM support system.

The following figures describe in more detail the ASM/ATFCM Network functions as well as the National functions, using generic names and their interaction.
2.4.2 Network Level View

The implementation of the FUA concept relies on local structures and on national bodies. As a result, common standards and procedures were adapted to their national needs. Since actors involved in ASM and ATFCM may differ from State to State, generic functions have been identified within the ASM/ATFCM trial activities of EUROCONTROL, in adherence with the enhanced FUA 2008 scenario. This approach should enable each partner to decide which role is best positioned to conduct the activity.

Airspace Management Function (ASMF): This function encompasses all responsibilities related to ASM activity (e.g. airspace allocation, AUP publication, airspace activation/de-activation). Possible actors operating this function could for instance be the AMC, the Approved Agency, the civil or military controller.

Network Management Function (NETF): This function encompasses all responsibilities related to ATFCM activities conducted during the pre-tactical and tactical phases within the Central Flow Management Unit. The possible actors operating this function could for instance be the Network Management Cell, the Tactical Network Coordinator, the Aircraft Operator Liaison Officer or any other liaison officer.

Local Flow Management Function (LOCF): This function encompasses all ATFCM activities under the responsibility of the ANSP conducted during the pre-tactical and tactical phases. Possible actors operating this function could for instance be a National Coordination Office, the Flow Management Position.

Airspace User Function (USEF): This function denotes all activities carried out by all airspace users including airlines, military, General Aviation and Aerial Work and Sport Aviation.

Central Airspace Data Function (CADF): This function encompasses all activities related to the collection, compilation and verification of Airspace Use Plans (AUP) and to the promulgation of the Conditional Routes Availability Message (CRAM).
2.4.3 State Level View

This paragraph details the possible ASMFs in a generic way.

While optimising national procedures, States allocated similar responsibilities to different roles. Generic functions have been identified and the system should be able to support these functions. A State organisation will not be modified if this is not required. This approach should enable each partner to decide which role is best positioned to conduct the activity.

This national or state view can also be transformed into a regional or FAB view by adding or changing an AMCF (e.g. FAB ASM unit or Regional ATFCM/ASM unit).

Airspace Management Coordination Function (AMCF): This function encompasses all responsibilities related to the drafting of the State airspace planning (e.g. CDM, AUP and UUP preparation, coordination with the network). Possible actors operating this function could be the AMC or any Approved Agency.

Military Airspace Planner Function (MAPF): This function encompasses all responsibilities related to the drafting of the military airspace planning (e.g. bookings or reservations, de-confliction, coordination with civil partners). Possible actors operating this function could be the AMC, the military ANSP, a controlling unit or any Approved Agency.

Civil Airspace Planner Function (CAPF): This function encompasses all ASM and ATFCM activities under the responsibility of the ANSP. Possible actors operating this function could for instance be a national coordination office, the Flow Management Position, the ANSP or any Approved Agency.
Airspace User Function (USEF): This function denotes all activities carried out by all airspace users including Airlines, Military, General Aviation, and Aerial Work and Sport Aviation.

Controlling Unit Function (CUF): This function encompasses all military controlling agencies. Possible actors could be a military ANSP, an Air Defence unit or any authorised control unit.

2.5 Stakeholder Requirements

2.5.1 Civil USEF Requirements

Civil airspace requests other than the utilisation of the network (e.g. glider championship area, civil aircraft test area) are introduced for processing through a civil State agency or designated agency. A swift response containing an approval, a change proposal or a denial shall be supported.

2.5.2 Military USEF Requirements

Military units need to be able to book airspace for their missions, depending on particular needs in terms of area, level and time. To properly support this activity, an airspace planning system needs to take into account the rules and procedures applied in the concerned state. To optimise the use of the airspace, the availability should be visible.

Support for conflict management between military users based on priority (depending on the mission) should be foreseen. The approval of requests shall be accommodated at the adequate hierarchical level and in sequence. The system needs to be sufficiently flexible to allow for cancelling and re-planning of missions e.g. due to adverse weather conditions.

Provision of an overview of the predicted civil capacity constraints to military units could help take them into account when booking airspace. The system should also support interstate military coordination and enable the planning of cross-border areas (CBA) and cross-border operations (CBO).

2.5.3 CUF Requirements

As military controlling units deliver services to the USEF, they need to acknowledge the airspace requests which have to be taken in consideration for organisational purposes (e.g. sectorisation, manning of controlling positions). A transactional process is needed to communicate with the users and the Airspace Manager function in real time.

Military controlling units need the consolidated airspace data (planning and status) to be able to visualise them to their controllers. This is part of the common situation awareness.

Automated planning and usage data collection should make service performance measurement available.

2.5.4 Civil ANSP Requirements

Civil ANSPs need to accept the USEF requests which have to be taken into consideration for organisational purposes (e.g. sectorisation, manning, capacity planning).

Civil ANSPs need to be provided with accurate and up-to-date information regarding the planned and real activation of the areas for the military within their area of interest.
They need the consolidated airspace data (planning and status) to be able to also visualise them to their controllers. This information should ideally go directly to the supervisor, flow management position and controller working positions, for tactical management of traffic and of sector capacity.

A view on the planning is a complement needed to support pre-tactical capacity management and to request additional CDR activation in case of capacity shortage, and to provide information at network level (see Annex E for an example of ASM system requirements for a civil ANSP – Maastricht UAC).

Civil ANSPs should be able to provide military units with an overview of predicted civil capacity constraints.

2.5.5 MAPF Requirements

The military airspace planner needs all relevant information to fulfil his responsibilities. The system should support him in the management of booking requests issued by military airspace users. He should be able to approve, propose or deny requests. A transactional process is needed to communicate in real time with the military USEF, CUF, AMC, civil ANSP, CAPF and network managers.

2.5.6 CAPF Requirements

The civil airspace planner needs all relevant information to fulfil his responsibilities. He should be able to approve, propose or deny requests. A transactional process is needed to communicate in real time with civil USEF, AMC, civil ANSP, MAPF, FMP and network managers.

2.5.7 AMCF Requirements

The AMC plays a key role in the airspace management process since it has to produce a balanced airspace user plan taking into account civil and military needs.

The ASM supporting system shall provide support for:

- The confirmation to the other roles of the last airspace plan;
- The interaction between airspace reservations and CDRs;
- The alignment of civil and military airspace requests;
- The analysis and display of network proposals or scenarios through simulations;
- The necessary communication with involved functions;
- The compilation of all airspace reservations and CDRs to support AUP, UUP, NOTAMs and AIP supplements.

2.5.8 NETF Requirements

The network requires monitoring of all roles from airspace planners upwards to see the effect of the airspace planning on the network as soon as practical.

Note: Environmental data consistency and integrity are required for stakeholders and network players. In the future, a central airspace data repository will ensure the provision of this type of information. Until then, the most complete environmental data should be made available to stakeholders.
3. PROCESS DESCRIPTION

3.1 Module 1 Airspace Planning

3.1.1 Purpose
This module should support all actions of the national (regional) airspace planning roles regardless of the State procedure or methodology.

Generic Process Based on Time

![Diagram of the Airspace Planning Module]

Figure 4: Airspace Planning Module

3.1.2 Process
- The concept is based on a time-based planning cycle starting from a blurred picture of the future activities in the airspace, moving up to a coordinated precise plan.
- Continuous coordination between all planning authorities is a basic component.
- At any moment of the planning cycle, simulation support shall be available to display and assess “what if scenarios”.
• The status of a certain airspace booking within the airspace management cycle shall also be transparent for all involved (e.g. requested, allocated). The processing of a request should be transparent at any given moment.

• Bookable airspace
Predefined areas (TSAs, TRAs, CBAs, RCAs, Ds and Rs), customised polygons (e.g. shuttle-tracks for Electronic Warfare flights) and circular areas shall be bookable.

To enable a complete booking process, the bookable areas shall include all manageable and non-manageable areas. CDRs and agreed Radar Vectoring Areas shall also be included in the booking process.

3.1.3 Event Calendar (EVC)
• The planning starts with an event calendar which collects the planned exercises or main events foreseen in the year and the next year(s) without knowing exactly the airspace requirements.

• This would give a first glance at the expected restrictions and by de-confliction of major exercises at an early stage would enable to minimize the effect on the network.

(E.g. to foresee problems and find solutions related to the simultaneous planning of two adjacent area’s by two States compromising the alternate routings.).

• The aim is to give all airspace planners and users a heads-up by delivering the information to a central information point such as the Network Operation Plan.

3.1.4 Long-Term Planning (LTP)
• If a more detailed airspace requirement is known about the planned activities on the EVC, the LTP starts. LTP mainly collects, analyses and presents information about:
  - large military exercises, military events (e.g. TLP courses, available AWACS) or civil events (e.g. world cup), especially the requested airspace needed for exercises;
  - GAT constraints which could have a significant impact on military activity (e.g. ‘Weekend Routes’ and subsequent limitations).

• Long-Term Planning is defined by default from X year ahead until 7 (parameter) working days prior to the Actual Date (Day). These reservations normally have a higher priority than short-term booked reservations.

• The LTP allows exercise planners to check activities already planned and de-conflict major exercises with major airspace needs. Conflicts between constraints and activities already planned can also be identified.

• Initial coordination (communication) should already be possible.

• Any conflicting airspace can be forwarded to the appropriate level(s) for decision (depending on the organisation).

• A possibility shall be foreseen for the Long-Term Planner to generate a NOTAM/AIP SUP request and send it to the NOTAM office when deemed necessary (in principle, every request involving uncontrolled or civil controlled airspace, or when a NOTAM is mandatory (see AIPs), will be announced by NOTAM/AIP SUP).
3.1.5 **Short-Term Planning (STP)**

- Based on the LTP, the STP activity will focus on:
  - Military booking of airspace coordinated with the appropriate services (e.g. Air Defence Controlling units)
  - Civil bookings coordinated with the ANSP and announcing expected civil constraints;
  - Assessing the mutual impact of reserved areas and CDRs;
  - Enabling the management of manageable/non-manageable airspace incorporating control centre capacity/availability according to set priorities;
  - Presenting a national/regional plan to the network managers (e.g. AUP);
  - Analysing proposals and alternatives from network managers;
  - Coordination between civil and military stakeholders concerning alternatives.

- Short-Term Planning is defined as from D-7 until D-1;
- Cooperative Decision-Making (CDM) is based on the priority guidelines from the ASM level 1 and should be a reference at all times;
- To optimise the military booking, information on available areas should be displayed within working distance;
- Users (e.g. squadron) should be able to introduce a request in a user-friendly way. The option should exist for some local hierarchical levels to confirm or accept the request. A national/regional (ASMF) management level shall adapt, approve or refuse the request. Inclusion of time parameters concerning the maximum processing time for each has to be foreseen;
- The system shall allow 3D airspace management;
- The system shall automatically detect the impact of a booking on other areas and routes. It shall also detect double bookings.

- Based on negotiation, the AMC manages all requests and proposes a plan which is made available to network managers in an automated way;
- If the network manager proposes an alternative plan which is better from a network perspective, this shall be analysed and the influenced requests shall be identified. Online coordination shall be possible to be able to challenge the proposal. This intensive coordination will ensure an actualised planning.

3.1.6 **Day Planning (DP)**

- On the day itself, civil and military could have pre-tactical requests (reservation of airspace or CDRs). The requests should be entered in the system which shall automatically detect the impact of such a booking on other stakeholders;
- It shall support coordination to grant or refuse such a request;
- This pre-tactical change request should be limited to x (parameter) hours before actual time. The time for consolidation of the airspace organisation is dependent on the ASM level 1 decision.
- The last updated planning shall be continuously displayed but a snapshot to be presented to the network should be possible (e.g. UUP).

3.1.7 **Tactical**

In some States ASM level 3 coordination is permanent and should also be supported and reflected in the planning.
3.2 Module 2 Airspace Status

The airspace status data module should be considered as the middle layer of the ASM support system between the airspace planning module and the airspace data collection module.

3.2.1 Purpose

This module should support the actions of the air traffic control roles by exchanging and enabling the display of actual airspace status data ensuring common situation awareness.

3.2.2 Process

- Airspace user (USEF) requests for airspace or CDRs shall be processed by the planning module.
- Whenever the responsibility of management is transferred from the airspace manager to the controlling authority, the airspace plan becomes an airspace status. The transition from airspace planning to airspace status is based on a time parameter defined at ASM level 1. The transfer to the airspace status module is initiated when tactical coordination needs to start.
- The responsible controlling authority activates and de-activates the area. The other airspace partners need to see this change in real-time and in a transparent manner.

3.2.3 Functional Requirements

The airspace status module shall be continuously updated. It shall be updated manually or via airspace booking retrieved from the Day page or a combination of both depending on the area. Manual updating comprises activation and de-activation of areas, routes and CDRs. When ASM level 1 allows for it, extension shall also be possible.

Information from the airspace status module shall be offered in time in different ways: as map view or as data available for insertion in an air situation display of an ATC system (or any other system such as CIMACT). If requested, a list view or Gantt chart view should also be delivered.

The airspace status module display shall be user dependant (colour coding, areas of interest,…).

For complex situations, a vertical view to complement the visualisation is recommended.

The necessary interfaces shall be foreseen in the generally agreed standards (AIXM).

Map View/Air Situation Display

The selectable airspace structures (TSA/TRA/CBA, CDRs, RCAs, RVAs, ATC sectors, other (manageable/non manageable areas,….) shall be available on a map view or an air situation display. A user defined area must also be displayed.

Any change to the status of an area or CDR shall be displayed and should be acknowledged by the system or manually. Positive acknowledgement should be visible on the other systems.

Actions from the responsible function/role will be activation, cancellation, extension or de-activation. The action shall be performed either via the status or planning display.

The relevant areas for a sector must be definable; therefore, only those areas affecting the controller’s area of responsibility are displayed and require acknowledging.

Recording: Airspace management activities as well as traffic display (if applicable) shall be recorded.
3.3 Module 3 ASM Data Collection for Performance Measurement

This module is the third layer of the ASM supporting system to support the assessment and reviewing of airspace management and airspace use processes. It shall collect the data of modules 1 and 2 in a harmonised way and be capable of interfacing with data analysis programmes such as the Agency application PRISMIL.

3.3.1 Purpose

To enable appropriate data collection for assessment of airspace efficiency, mission effectiveness and flexibility of airspace use. Data will be collected and stored in a standard format which can easily be accessed via an interface.

3.3.2 Process and Principle

- The Import Facility will be developed by the analysis programs (e.g. PRISMIL);
- Interoperability between the analysis programmes and LARA shall be based on the AIXM 5 data model extended for civil-military and military needs;
- Airspace status data and actions performed on the system shall be recorded as a minimum. All interactions with the system should also be recorded.

Example of an interface: LARA–PADAC\(^3\) (PRISMIL Programme) Interface

Figure 5: LARA-PADAC Interface

---

\(^3\) PRISMIL Automated Data Acquisition and Collection
The LARA database should supply the analysis programmes with data regarding the following Key Performance Indicators (KPI) aggregation:

1. FUA application
2. Adherence to optimum airspace dimensions
3. Utilisation of airspace
4. Efficient booking procedures
5. Economic impact of transit
6. Impact of airspace location on training
7. Training in non-segregated areas
8. Release of airspace

Functions involved: approved authority, airspace users, ANSPs, military controlling units.
4. CONCLUSIONS

Although significant progress has been made in the development and application of FUA, current airspace management procedures, airspace availability notification processes and fragmented or lack of supporting systems inhibit the efficient application of FUA.

One of the improvements of airspace management in the short-term is to develop a system to support national airspace planning, to distribute the consolidated airspace status and to harmonise the collection of data to ensure accurate and transparent performance analysis.

A European networked or central airspace database to which States feed airspace and route availability information using a harmonised local application and from which all users access information would provide a coherent picture of the airspace and route status. Although it would not be vital for all States to use a standard local ASM application, cooperation between States in the design of such application would benefit continued ASM development.

Based on this conceptual description, functional specifications shall be drafted to capture a majority of stakeholder requirements.
## Annex A: Glossary of Terms

### A
- ACA: AUP/UUP Composition Application
- ACC: Area Control Centre
- ADEXP: ATS Data Exchange Presentation
- ADR: Airspace Data Repository
- AEW: Airborne Early Warning
- AFTN: Aeronautical Fixed Telecommunications Network
- AIP: Aeronautical Information Publication
- AIP SUP: AIP Supplement
- AIRAC: Aeronautical Information Regulation And Control
- AIS: Aeronautical Information Service
- AMC: Airspace Management Cell
- AMCF: Airspace Management Coordination Function
- AMP: Belgian Airspace Management Programme (system)
- ANSP: Air Navigation Service Provider
- AO: Airline Operator
- AS: Airspace
- ASM: Airspace Management
- ASMF: Airspace Management Function
- ATC: Air Traffic Control
- ATFCM: Air Traffic Flow & Capacity Management
- ATFM: Air Traffic Flow Management
- ATS: Air Traffic Service
- AUP: Airspace Use Plan

### C
- CADF: Centralised Airspace Data Function (part of CFMU)
- CAOC: Combined Air Operations Centre
- CAPF: Civil Airspace Planner Function
- CAS: Controlled Airspace
- CBA: Cross-Border Area
- CBA: Cost-Benefit Analysis
- CBO: Cross-Border Operations
- CDM: Collaborative Decision-Making
- CDR: Conditional Route
- CFMU: Central Flow Management Unit
- COTS: Commercial Off-The-Shelf
- CRAM: Conditional Route Availability Message
- CRC: Control and Reporting Centre
- CUF: Controlling Unit Function
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>Danger area</td>
</tr>
<tr>
<td>DAT</td>
<td>Airspace use data</td>
</tr>
<tr>
<td>DMEAN</td>
<td>Dynamic Management of European Airspace Network</td>
</tr>
<tr>
<td>DP</td>
<td>Day Planning</td>
</tr>
<tr>
<td>E</td>
<td></td>
</tr>
<tr>
<td>EAD</td>
<td>European AIS Database</td>
</tr>
<tr>
<td>EATMP</td>
<td>European Air Traffic Management Programme</td>
</tr>
<tr>
<td>EASM</td>
<td>Enhanced Airspace Management</td>
</tr>
<tr>
<td>EC</td>
<td>European Commission</td>
</tr>
<tr>
<td>ENV</td>
<td>CFMU Environment database</td>
</tr>
<tr>
<td>EOBT</td>
<td>Estimated Off Blocks Time</td>
</tr>
<tr>
<td>ETFMS</td>
<td>CFMU Enhanced Traffic and Flow Management System</td>
</tr>
<tr>
<td>EVC</td>
<td>Event Calendar</td>
</tr>
<tr>
<td>F</td>
<td></td>
</tr>
<tr>
<td>FAB</td>
<td>Functional Airspace Block</td>
</tr>
<tr>
<td>FDP</td>
<td>Flight Data Processing</td>
</tr>
<tr>
<td>FIR</td>
<td>Flight Information Region</td>
</tr>
<tr>
<td>FIS LW</td>
<td>Führungs- und Informationssystem Luftwaffe (Swiss Air Force Planning System)</td>
</tr>
<tr>
<td>FL</td>
<td>Flight Level</td>
</tr>
<tr>
<td>FLORAKO</td>
<td>Swiss Air Defence System</td>
</tr>
<tr>
<td>FMP</td>
<td>Flow Management Position</td>
</tr>
<tr>
<td>FPL</td>
<td>Flight Plan</td>
</tr>
<tr>
<td>FUA</td>
<td>Flexible Use of Airspace</td>
</tr>
<tr>
<td>G</td>
<td></td>
</tr>
<tr>
<td>GAT</td>
<td>General Air Traffic</td>
</tr>
<tr>
<td>GND</td>
<td>Ground</td>
</tr>
<tr>
<td>I</td>
<td></td>
</tr>
<tr>
<td>ICAO</td>
<td>International Civil Aviation Organisation</td>
</tr>
<tr>
<td>IFPS</td>
<td>Integrated Initial Flight Plan Processing System (CFMU flight plan processing system)</td>
</tr>
<tr>
<td>IFR</td>
<td>Instrument Flight Rules</td>
</tr>
<tr>
<td>K</td>
<td></td>
</tr>
<tr>
<td>KPI</td>
<td>Key Performance Indicator</td>
</tr>
<tr>
<td>L</td>
<td></td>
</tr>
<tr>
<td>LTP</td>
<td>Long-Term Planning</td>
</tr>
<tr>
<td>LOCF</td>
<td>Local Flow Management Function</td>
</tr>
<tr>
<td>M</td>
<td>MAPF</td>
</tr>
<tr>
<td>---</td>
<td>------</td>
</tr>
<tr>
<td>MICAMS</td>
<td>Military-Civil Airspace Management System (Switzerland)</td>
</tr>
<tr>
<td>MoD</td>
<td>Ministry of Defence</td>
</tr>
<tr>
<td>MoU</td>
<td>Memorandum of Understanding</td>
</tr>
<tr>
<td>MTA</td>
<td>Military Training Area</td>
</tr>
<tr>
<td>(M)TRA</td>
<td>Military Temporary Reserved Airspace</td>
</tr>
<tr>
<td>(M)VPA</td>
<td>Military Variable Profile Area</td>
</tr>
<tr>
<td>N</td>
<td>NETF</td>
</tr>
<tr>
<td>NOTAM</td>
<td>Notice to Airmen</td>
</tr>
<tr>
<td>O</td>
<td>OAT</td>
</tr>
<tr>
<td>P</td>
<td>PADAC</td>
</tr>
<tr>
<td>PCA</td>
<td>Prior Coordination Area</td>
</tr>
<tr>
<td>PLA</td>
<td>Airspace planning</td>
</tr>
<tr>
<td>PREDICT</td>
<td>CFMU forecasting tool (part of ETFMS system)</td>
</tr>
<tr>
<td>PRISMIL</td>
<td>Programme for the Development, Implementation and Monitoring of Automated Data Collection Supporting Military KPI</td>
</tr>
<tr>
<td>Q</td>
<td>QNH</td>
</tr>
<tr>
<td>R</td>
<td>Restricted area</td>
</tr>
<tr>
<td>RAD</td>
<td>Route Availability Document</td>
</tr>
<tr>
<td>RCA</td>
<td>Reduced Coordination Airspace</td>
</tr>
<tr>
<td>RVA</td>
<td>Radar Vectoring Area</td>
</tr>
<tr>
<td>S</td>
<td>SEROS</td>
</tr>
<tr>
<td>SOSA</td>
<td>Belgian Squadron Operations Support Automatic data processing (system)</td>
</tr>
<tr>
<td>STA</td>
<td>Airspace status</td>
</tr>
<tr>
<td>STANLY_MVPA</td>
<td>German AS booking system (part of larger STANLY system)</td>
</tr>
<tr>
<td>STP</td>
<td>Short-Term Planning</td>
</tr>
<tr>
<td>T</td>
<td>TAR</td>
</tr>
<tr>
<td>TLP</td>
<td>Tactical Leadership Programme (NATO)</td>
</tr>
<tr>
<td>TNC</td>
<td>Tactical Network Coordinator (at CFMU)</td>
</tr>
<tr>
<td>TRA</td>
<td>Temporary Restricted Area</td>
</tr>
<tr>
<td>TSA</td>
<td>Temporary Segregated Area</td>
</tr>
<tr>
<td>U</td>
<td>UAV</td>
</tr>
<tr>
<td>USEF</td>
<td>Airspace User Function</td>
</tr>
<tr>
<td>UUP</td>
<td>Updated Use Plan (update to Airspace Use Plan)</td>
</tr>
</tbody>
</table>
Annex B: Reference Documents

[1] Independent Study for the Improvement of ATFM Final Report – V 2.0
   29 September 2000

   October 2001

   12 May 2003

   17 December 2003, (Amendment 1, 2 December 2004)

   18 December 2002

   14 July 2004

[7] DMEAN concept
   16 September 2004

   29 September 2004

   2005

[10] Evaluation of enablers for FUA by civil and military airspace users commissioned by the Performance Review Commission (PRC)
    2007

    23 December 2005
### Annex C: EC Regulation 2150/2005 (FUA) Analysis

<table>
<thead>
<tr>
<th>Reference</th>
<th>Conceptual Description</th>
<th>Ops Requirements</th>
</tr>
</thead>
</table>
| EC FUA REG Whereas (4) | - The tool will support ASM and ATS cooperation between national military organisations  
- The tool shall enable a harmonised application of the FUA concept | - Link military ASM and ATS units at national and international levels  
- Support military booking  
- Support harmonised FUA procedures |
| EC FUA REG Whereas (5) | - The tool will improve the current application of the FUA  
- The tool shall take account of the FUA specifications | - Automation of tasks  
- Support analysis and cooperative decision-making  
- Support data sharing and cooperation procedures |
| EC FUA REG Whereas (7) | The tool will support the planning and allocation of temporary segregated areas | - Support planning of TSA/TRA/D  
- Provide the necessary AIS data  
- Support data sharing |
| EC FUA REG Whereas (8) | The tool shall apply community rules for civil-military coordination | TBC |
| EC FUA REG Whereas (10) | The tool shall support CBO and CBA management | Link different national military airspace managers at levels 2 and 3 |
| EC FUA REG Whereas (11) | The tool shall support all functions and/or organisations identified as responsible in the application of FUA | - Support common and specific functionalities to support different functions and organisations. (customisation possibilities)  
- Accessible to a maximum of identified stakeholders  
- Protected by access rights |
| EC FUA REG Whereas (12) | The tool shall support consistent procedures for civil-military coordination and use of common airspace in a FAB | - Flexible to be used at FAB level  
- International link between national stakeholders (network) |
| EC FUA REG Whereas (13) | The tool shall address the strategic, pre-tactical and tactical levels in a coherent way | Interdependency and consistency between strategic, pre-tactical and tactical levels (one continuous process) |
| EC FUA REG Whereas (14) | The tool will ensure more consistency between airspace management, air traffic flow management and air traffic services | - Link ASM-ATFCM-ATS data  
- Display of integrated data (ASM, ATFCM and ATS) |
| EC FUA REG Whereas (15) | The tool will support the optimum use of available airspace | - Link civil and military airspace planning  
- Support AMC tasks  
- Proposes best options to stakeholders |
| EC FUA REG Whereas (16) | The tool shall ensure timely distribution of accurate information on airspace status to civil and military controllers | - Sharing of airspace status data  
- Timely (real-time) distribution  
- Accurate and understandable data by sharing the display  
- Entry of info by managers in charge |
<table>
<thead>
<tr>
<th>Reference</th>
<th>Conceptual Description</th>
<th>Ops Requirements</th>
</tr>
</thead>
</table>
| EC FUA REG Whereas (17) | The tool shall ensure timely access to up-to-date information on airspace status for all parties wishing to take advantage of airspace structures made available | - Sharing of airspace status data  
- Timely (real-time) access  
- Entry of up-to-date info by managers in charger |
| EC FUA REG Whereas (18) | The tool shall enable regular assessment of airspace use | - Storing data in a standard way concerning ASM to enable further use by analysis tools  
- Deliver data for nationally and internationally recognised KPIs |
| EC FUA REG Art 3 (a) | The tool shall support the agreements and procedures for coordination between civil and military authorities at strategic, pre-tactical and tactical levels | Consider and display procedures and agreements concerning ASM |
| EC FUA REG Art 3 (b) | The tool shall ensure consistency between airspace management, air traffic flow management and air traffic services at strategic, pre-tactical and tactical levels | - Link ASM, ATFCM and ATS  
- Make consistency transparent (one big process) |
| EC FUA REG Art 3 (c) | The tool shall enable the release of temporary airspace reservations for exclusive or specific use as soon as the activity ceases | De-activation of temporary reserved or segregated areas (airspace status) |
| EC FUA REG Art 3 (d) | The tool shall ensure operational and technical coordination between States to support FUA across national borders | Link national ASM entities to be able to coordinate and support ASM for CBO and CBA |
| EC FUA REG Art 3 (e) | The tool shall show the stakeholders when airspace is available | - Sharing of planning data  
- Sharing of activation and de-activating data |
| EC FUA REG Art 4 1(b) | The tool shall deliver statistical data to review the user’s requirements | Data collection on airspace planning and airspace occupation |
| EC FUA REG Art 4 1(d) | The tool will display temporary airspace structures to offer multiple airspace reservation and route options | - Display different scenarios  
- Flexible adaptable areas and routes |
| EC FUA REG Art 4 1(f) | The tool shall deliver airspace data to assess the national airspace structures and route network | Collect and store ASM data |
| EC FUA REG Art 4 1(h) | The tool shall support cross-border airspace use | - Cross-border network  
- Visibility of planning to all potential users |
| EC FUA REG Art 4 1(j) | - The tool shall support the management of available airspace structures at national level and show the possible impact at network level  
- The tool shall support the network management | - Manage airspace requests at national level  
- Display impact of the requests at network level  
- Link with network tool  
- Deliver national planning data to network |
| EC FUA REG Art 4 1(m) | The tool will support the collection of data needed for KPIs | - Data collection and storage  
- Link with statistic analysis tools |
<p>| EC FUA REG Art 4 1(n) | The tool shall archive data of the requests and allocation of airspace structures | Data collection and storage |
| EC FUA REG Art 4 2 | The tool shall consider civil and military requirements | Civil and military requirements |</p>
<table>
<thead>
<tr>
<th>Reference</th>
<th>Conceptual Description</th>
<th>Ops Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC FUA REG Art 5.3</td>
<td>The tool shall enable the airspace management cell to manage airspace allocation and to communicate in good time the airspace availability to all affected users, airspace management cells, air traffic service providers and all relevant partners and organisations</td>
<td>Support AMCs in the national ASM process - Data sharing with CFMU (civil users) - Data sharing between civil and military via national and/or international network</td>
</tr>
<tr>
<td>EC FUA REG Art 6.2</td>
<td>The tool shall ensure that the relevant controlling military units and air traffic services exchange any modification of the planned activation of airspace in a timely and effective manner and notify to all affected users the current status of the airspace</td>
<td>Real time data exchange - Manage tactical changes - Data sharing of airspace status - Providing data to network (civil users), national network (military users, controlling units, ATS units,...)</td>
</tr>
<tr>
<td>EC FUA REG Art 6.3</td>
<td>The tool shall be a supporting system between air traffic service units and controlling military units in order to ensure safety when managing interactions between civil and military flights</td>
<td>Link concerned units and civil ATS</td>
</tr>
<tr>
<td>EC FUA REG Art 6.5</td>
<td>The tool shall enhance real-time airspace management agreements between civil air traffic services units and military air traffic services units and/or controlling military units</td>
<td>Tactical coordination of airspace - Sharing airspace data (Status) - Activation – deactivation of areas</td>
</tr>
</tbody>
</table>
## Annex D: National ASM Supporting Systems

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Planning</th>
<th>Airspace Status</th>
<th>Data (KPI Provision)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BE MIL</td>
<td>AMP II</td>
<td>AMP II/SEROS 2</td>
<td>Raw AMP II Sosa data</td>
</tr>
<tr>
<td>BE CIV</td>
<td>-</td>
<td>AMP II/CANAC</td>
<td>-</td>
</tr>
<tr>
<td>CH MIL</td>
<td>FIS LW</td>
<td>MICAMS/FLORAKO</td>
<td>FIS LW</td>
</tr>
<tr>
<td>CH CIV</td>
<td>Excel tool</td>
<td>DAM/CIV ATC System</td>
<td>FIS LW MICAMS</td>
</tr>
<tr>
<td></td>
<td>June 2007 FIS LW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FR MIL</td>
<td>DIANE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FR CIV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GE MIL</td>
<td>STANLY/MVPA (under study)</td>
<td>Under study</td>
<td></td>
</tr>
<tr>
<td>GE CIV</td>
<td>STANLY/MVPA</td>
<td>STANLY/MVPA</td>
<td>STANLY/MVPA</td>
</tr>
<tr>
<td>NL MIL</td>
<td>Under study</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NL CIV</td>
<td>Under study</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UK MIL</td>
<td>Under development</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UK CIV</td>
<td>RACRA/JAMS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Annex E: ASM Support System Requirements for Civilian ANSPs

Maastricht UAC Proposal

Preliminary Remarks
1. The requirements below were provided by Maastricht UAC and only represent this centre's point of view. Therefore, these requirements may not necessarily be entirely suitable or applicable for other civil ATC centres;
2. In the light of the experienced traffic increase, Maastricht UAC would like to emphasise the importance of an efficient application of the FUA concept;
3. The ASM System should be compatible with the systems and concepts in use within all three sector groups defined in the Area of Responsibility of Maastricht UAC (DECO, Hannover and Brussels Sector Group).

1. Aim
The aim of every ATS Unit is to provide a safe and efficient service, with an effective use of all possible available airspace with a maximum throughput of traffic.

In this context, the ACC continuously assesses traffic demand and available capacity, in order to avoid:
- over-delivery of traffic (protection of control staff from overload situations);
- under-delivery of traffic (avoiding unnecessary delay).

2. Traffic Demand

Concept
The traffic demand is predicted by use of data provided by CFMU. These data are carefully analysed by specialist personnel, taking into account the quantitative and, more importantly, qualitative factors.

Requirements
The ASM support system will not be used for determining the civil traffic demand and thus no specific requirements are defined by Maastricht UAC in this area.

Nevertheless, it is recognised that a link between the ASM support system and other CFMU systems should be foreseen in order to allow an exchange of data. However, this aspect falls outside the scope of the present paper.

3. Availability Capacity

Concept
Airspace reservations for military activities are taken into account when determining the available capacity of a civil ACC/UAC at strategic, pre-tactical and tactical level, with increasing accuracy towards the actual time of operations.

Requirements
A planning, projected in time, for the various military TRAs and exercise areas, should be displayed at the relevant working positions within the civil ACC/UACs.
The display should be:
- **AVAILABLE**  The data must be permanently available to the civil ACCs and continuously updated and refined until the time of operations
- **UNAMBIGUOUS** Especially with regard to which ANSP will provide the ATS
- **RELEVANT** Only relating to relevant airspace for the respective civil ACC/UAC
- **CLEAR** The display of the airspace planning should be easy to interpret by the civil ACC/UACs without unnecessary subdivisions of airspace, except where relevant
- **CONSISTENT** Avoiding misinterpretations in case of overlapping portions of airspace in different level bands and across national boundaries (CBAs)
- **ROBUST** An indication of the robustness of the planning, according to ASM level 1 agreements (e.g. FUA3+ principles), must be provided
- **RELIABLE** Without technical interruptions
- **INTEGRITY** Ensuring detection of corrupt data and consequent warning if the quality of data can not be guaranteed
- **USER FRIENDLY** The system shall include user-friendly features to interact with the display

4. **Collaborative Decision-Making (CDM)**

**Concept**
Civil ACC/UACs participate in the CDM process with regard to airspace allocation, which is regarded as one of the tactics used to resolve capacity shortfalls compared to traffic demand.

**Requirements**
Civil ACC/UAC shall be able to make requests for:
- The reservation of airspace of defined dimensions for the use of vectoring GAT (RVA);
- The opening of CDR3s for use on ATC discretion;
- The opening of CDR2s which can be flight planned by AOs.

The civil ACC/UAC must have a robust picture of the planning of the airspace and of the potential airspace portions which can be requested, based on ASM level 1 priorities and rules.

In addition to the requirements mentioned above, any system should also include the following features:
- On-line display of all requests;
- Real-time track keeping of the way the request is processed;
- Real-time display to all involved parties of approval/disapproval or change of requests.
5. Presentation of Airspace Status to Civil Controllers

Concept
The controllers at the civil ACC/UACs must be informed continuously about the status of the airspace and will be warned, in a timely manner, of any pending changes to the airspace status.

Requirements
In addition to all requirements mentioned above, the radar map used by controllers at a civil ACC/UAC shall integrate the current airspace status in a correct, unambiguous and coherent manner. Any pending changes to the airspace status of the various, relevant airspace portions, should be indicated on the radar screen.

For this application, the following characteristics are of vital importance:

- **AVAILABILITY** The airspace status should be permanently available and updated
- **RELIABILITY** The data should be available without technical interruptions or delay
- **CORRECTNESS** The data should be correct at all times
- **INTEGRITY** Any corrupt data, failure or inconsistency must be detected and must trigger a warning to the user
- **BUFFER CALCULATION** The display shall present the airspace available to the civil ATCO taking into account the buffers that must be respected. The ASM system shall automatically apply the buffers conform to the applicable agreements and in function of certain parameters (e.g. type of activity inside a TRA)

6. Override Functions

It is recognised that not all scenarios can be predicted or pre-planned. Therefore, the system shall include an override function, taking into account the “rights” and responsibilities of the various users.

“Override” Requirement
The ASM System must allow that certain output, automatically produced by the system, can be modified by human intervention provided that the operator has the authority to do so. (e.g. the status at a certain moment of a certain portion of airspace must be adaptable by the airspace manager).

7. Important Legal Requirement & Incident Investigation

In addition to the technical and operational requirements mentioned above, the following requirement should be considered from a legal and liability point of view, taking into account the aspect of incident investigation.

**Legal Requirement**
The use of the system must be laid down in clear agreements which specify who is responsible for the correctness of the various data exchanged between partners and used to make operational decisions.

The ASM support system should store the relevant data necessary to conduct incident investigations.
8. Process Overview
**Annex F: Compliance with Interoperability Regulation**

<table>
<thead>
<tr>
<th>Heading #</th>
<th>Description</th>
<th>LARA Description</th>
<th>Compliance Status</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chapter I, Article 1, §2</strong></td>
<td>This Regulation shall apply to the systems, their constituents and associated procedures identified in Annex I</td>
<td>An ASM supporting system shall support the FUA and enhanced FUA concept, dynamic ASM, cross-border operations (CBO) and de-centralised or centralised airspace management at state level and regional level (such as Functional Airspace Block)</td>
<td>compliant</td>
</tr>
<tr>
<td><strong>Annex I (extract)</strong></td>
<td>List of Systems for Air Navigation Services</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>For the purpose of this Regulation the EATMN is subdivided into eight systems.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Systems and procedures for airspace management</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Chapter II, Article 2</strong></td>
<td>The EATMN, its systems and their constituents and associated procedures shall meet essential requirements. The essential requirements are set out in Annex II.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Annex II (extract)</strong></td>
<td>Essential Requirements</td>
<td>It shall support the airspace planning cycle as early in the process as possible and automate recurrent tasks to the further extent. It shall be customer-oriented, with an efficient link between airspace users, service providers and the airspace managers. A key aspect is the real-time presentation of the same data to all roles. It shall also be able to support the ASM procedures and organisation of the different States. The system should assure common, secure and consolidated information exchange of the current airspace status. Data exchange with existing ATC systems should be offered as a choice to stakeholders.</td>
<td>compliant</td>
</tr>
<tr>
<td></td>
<td>Part A: General requirements</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>These are network-wide requirements that are generally applicable to each one of the systems identified in Annex I.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Seamless operation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Air traffic management systems and their constituents shall be designed, built, maintained and operated using the appropriate and validated procedures, in such a way as to ensure the seamless operation of the EATMN at all times and for all phases of flight. Seamless operation can be expressed, in particular, in terms of information-sharing, including the relevant operational status information, common understanding of information, comparable processing performances and the associated procedures enabling common operational performances agreed for the whole or parts of the EATMN.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 2. Support for new concepts of operation

The EATMN, its systems and their constituents shall support, on a coordinated basis, new agreed and validated concepts of operation that improve the quality and effectiveness of air navigation services, in particular in terms of safety and capacity. The potential of new concepts, such as collaborative decision-making, increasing automation and alternative methods of delegation of separation responsibility, shall be examined taking due account of technological developments and of their safe implementation, following validation.

### 3. Safety

Systems and operations of the EATMN shall achieve agreed high levels of safety. Agreed safety management and reporting methodologies shall be established to achieve this. In respect of appropriate ground-based systems, or parts thereof, these high levels of safety shall be enhanced by safety nets which shall be subject to agreed common performance characteristics.

A harmonised set of safety requirements for the design, implementation, maintenance and operation of systems and their constituents, both for normal and degraded modes of operation, shall be defined with a view to achieving the agreed safety levels, for all phases of flight and for the entire EATMN.

Systems shall be designed, built, maintained and operated, using the appropriate and validated procedures, in such a way that the tasks assigned to the control staff are compatible with human capabilities, in both the normal and degraded modes of operation, and are consistent with required safety levels.

Systems shall be designed, built, maintained and operated using the appropriate and validated procedures, in such a way as to be free from harmful interference in their normal operational environment.

### Module 1: Airspace Planning (PLA):

This module shall support airspace booking or reservation, analysis, civil-military planning coordination, simulation, collaborative decision-making, AMC decision-making, cross-border coordination, information promulgation and airspace allocation mainly based on national or FAB harmonised procedures.

Interoperability as a key enabler shall be sought in order to foster information exchange; therefore latest communication standards shall be incorporated.

### Module 2: Airspace Status (STA):

This module shall support level 3 management of airspace including short-term cancelation and additional change or allocation of airspace. It shall be capable of interfacing with ATC systems.

Integrity of data is a major flight safety concern. Users shall always have access to the correct information to ensure flight safety. Due to the impact on flight safety of certain functions, the integrity of data shall at all times be guaranteed. An acknowledgement for all input having an influence on the status of the airspace and controlled access to authorised functions should guarantee the integrity of data.

The use of the system must be laid down in clear agreements which specify those responsible for the correctness of the various data that are exchanged between partners and which are used to make operational decisions. The status of the data should be transparent.

### Compliance Status

- **compliant**
<table>
<thead>
<tr>
<th>Heading #</th>
<th>Description</th>
<th>LARA Description</th>
<th>Compliance Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.</td>
<td><strong>Civil-military coordination</strong></td>
<td>The system should assure a common, secure and consolidated information exchange of the current airspace status. Data exchange with existing ATC systems should be offered as a choice to the stakeholders. All data within the system should be retained and available for performance analysis purposes. Transparency should be one of the main drivers for the system.</td>
<td>compliant</td>
</tr>
<tr>
<td>5.</td>
<td><strong>Environmental constraints</strong></td>
<td>Systems and operations of the EATMN shall take into account the need to minimise environmental impact in accordance with Community legislation.</td>
<td>Software</td>
</tr>
</tbody>
</table>
| 6.        | **Principles governing the logical architecture of systems** | LARA system development cycle:  
1. Demonstrator  
2. Prototype  
3. Version 1  
4. Version 2 | compliant |
| 7.        | **Principles governing the construction of systems** | An open architecture shall guarantee its interface with existing and future systems. Three distinctive areas in airspace management need to be supported. A unique system based on a modular approach is preferred to three separate systems to guarantee transparency for potential users. Additionally, a modular approach should make it possible to connect existing systems. **Module 1:** Airspace Planning (PLA) **Module 2:** Airspace Status (STA) **Module 3:** Airspace Management Data Collection for Performance Measurement (DAT) | compliant |
### ESSENTIAL REQUIREMENTS

#### Part B: Specific requirements

These are the requirements that are specific to each one of the systems and that complement or further refine the general requirements.

1. **Systems and procedures for airspace management**
   1.1. Seamless operation

   Information relating to pre-tactical and tactical aspects of airspace availability shall be provided to all interested parties in a correct and timely way so as to ensure an efficient allocation and use of airspace by all airspace users. This should take into account national security requirements.

   An ASM supporting system shall support the FUA and enhanced FUA concept, dynamic ASM, cross-border operations (CBO) and de-centralised or centralised airspace management at state level and regional level (such as Functional Airspace Block). It shall be customer-oriented, with an efficient link between airspace users, service providers and airspace managers. A key aspect is the real-time presentation of the same data to all roles. It shall also be able to support the ASM procedures and organisation of the different States. The system should assure common, secure and consolidated information exchange of the current airspace status. Data exchange with existing ATC systems should be offered to stakeholders as a choice.

<table>
<thead>
<tr>
<th>Heading #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ESSENTIAL REQUIREMENTS</strong></td>
<td></td>
</tr>
<tr>
<td>Part B: Specific requirements</td>
<td></td>
</tr>
<tr>
<td>1. Systems and procedures for airspace management</td>
<td></td>
</tr>
<tr>
<td>1.1. Seamless operation</td>
<td></td>
</tr>
<tr>
<td>Information relating to pre-tactical and tactical aspects of airspace availability shall be provided to all interested parties in a correct and timely way so as to ensure an efficient allocation and use of airspace by all airspace users. This should take into account national security requirements.</td>
<td></td>
</tr>
<tr>
<td>An ASM supporting system shall support the FUA and enhanced FUA concept, dynamic ASM, cross-border operations (CBO) and de-centralised or centralised airspace management at state level and regional level (such as Functional Airspace Block). It shall be customer-oriented, with an efficient link between airspace users, service providers and airspace managers. A key aspect is the real-time presentation of the same data to all roles. It shall also be able to support the ASM procedures and organisation of the different States. The system should assure common, secure and consolidated information exchange of the current airspace status. Data exchange with existing ATC systems should be offered to stakeholders as a choice.</td>
<td>compliant</td>
</tr>
</tbody>
</table>