EUROPEAN ORGANISATION
FOR THE SAFETY OF AIR NAVIGATION

EUROCONTROL

Generic Safety Case for the Creation and Operation of CBA

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Abstract

This Safety Case aims at demonstrating that operation of GAT traffic under the responsibility of ANSP (state A) and ANSP (state B) will be acceptably safe during the periods of activation of the newly created CBA. This Safety Case addresses the safety issues at the interface between GAT outside the CBA and military activity in the CBA from civilian ANSPs point of view. The present document was developed with the intent to provide an example for any airspace projects Safety Cases.

Keywords

Safety Case	OHA	FHA	CBA
TSA CR	D		

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CONTENTS

EXECUTIVE SUMMARY

Project Origin

The Cross – Border Area (CBA) project between (state A) and (state B) organisations was officially launched in dd/mm/yyyy, CBAs are planned to be implemented on dd/mm/yyyy.

The Project is covered by a State Framework Agreement.

Project Development

A group of experts was set-up to develop a CONOPS which version X.X and previous versions were used to conduct the safety assessments; it describes in details the following items:

- The airspace definition;
- The ASM procedures (levels 1,2 and 3);
- Training;
- Concept acceptance;
- Other issues;
  - Contingency;
  - Occurrence investigation;
  - Liability;
  - Reporting;
- Search and Rescue; and
- Minimum facilities.

Further to the CONOPS, the following LoAs put in a form of legal agreement the provisions of the CONOPS:

- CAA (state A)/CAA (state B);
- ANSP (state A)/ANSP (state B);
- AMC (state A)/AMC (state B);
- ANSP(s)/FA FC;
- AMC(s)/CFMU;
- Lead AMC/CFMU.

And (although not within the scope of this safety case)

- AF(state A)/AF(state B) MoU and Technical arrangements

Safety Case

Differences in the current application of the flexible use of airspace concept in (state A) and (state B) have been identified during the planning process of the CBA implementation. Due to the nature of the CBA operations it is imperative that both countries apply the same set of rules and procedures in a uniform manner.

Therefore it was decided that a joint safety assessment will be conducted by the participating service providers.

The safety assessments activities were supported by expert staff, namely ATC supervisors, ATC controllers (military and Civil), Fighter Controllers, Fighter Allocators, Engineers, Safety specialists and pilots with extensive experience have participated to the workshop that took place to build the OHA (see "OHA Report CBA" for details on participants).

Scope

This Safety Case addresses the safety issues at the interface between GAT outside the CBA and military activity in the CBA from civilian ANSPs point of view.

Safety Case Assumption(s)

As it is not within the remit of ANSP (state A) and ANSP (state B) to do any kind of verification of the military preparedness for CBA operations, it is assumed that Safety requirements (as identified and agreed during the safety assessment activities in the context of this Safety Case) to be implemented by Military entities will be carried out prior to the actual usage of the CBA. This covers training of military staff to be delivered and technical equipment verifications to be done.

Aim of the Safety Case

The aim (Top Claim) of the safety case is to provide arguments and evidence that "GAT Operations under ANSP (state A) and ANSP (state B) responsibility will be acceptably safe during periods of activation of CBA".

Safety Case Results

The Top Claim described above is supported by 3 main arguments. The first argument together with related evidence show that the CONOPS is:

- Complete;
- Correct;
- Robust against abnormal conditions of operations and external failures; and that
- Internal failures have been identified and mitigated sufficiently

The second argument together with related evidence show that the activities required to be completed prior to implementation of the CBA have been carried out. This includes training of staff, technical adaptations and testing, procedures completion, publication of aeronautical information and coordination with external partners e.g. CFMU.

And the third argument together with related evidence show that the monitoring of the operational use of CBA will be sufficient to show that these operations are acceptably safe. This includes verification of assumptions described above as well as monitoring of specific issues as described below.

Safety Case Limitations

The conclusions of this Safety Case are largely based on expert judgement as it could not be proceeded otherwise (no data available on CBA operations). Even if the selection of experts was carefully made this is nevertheless human experience based judgement.

It should therefore be acknowledged that the accuracy of the data provided herein is subject to the human limitations.

Adequate monitoring of operations as described above shall ensure necessary adaptations of the concept are made in due time.

Recommendations

As identified.

Conclusions

Having regards the production of adequate evidence for each sub-argument and therefore the conclusive satisfaction of all sub-arguments and top level arguments it can be concluded that:

1. Operations during periods of activation of CBA under the foreseen permanent arrangements will be at least as safe as same operations conducted under temporary arrangements

AND

2. The risk of an accident will be reduced as far as reasonably practicable

1. INTRODUCTION

1.1 Background/Example

The Cross – Border Area (CBA) project between (state A) and (state B) was officially launched in dd/mm/yyyy. The project has involved all the relevant stakeholders (regulators, service providers and air forces) of both participating states. Additionally, ministry level coordination between the states has taken place in order to develop high level framework agreements enabling cross – border operations (CBO).

The drafted CBA are planned to be implemented on dd/mm/yyyy by an entry into force of the relevant Letters of Agreement and a coordinated publication of the areas by the national AIS departments.

This concept document describes the processes involved in the reservation, allocation and operational use of the CBA. Further details regarding these arrangements and processes are in the respective Letters of Agreement.

1.2 Operational Background

As relevant

1.3 Legislative Aspects

1.3.1 Single European Sky

Whilst the Single European Sky initiative in general and the EC regulation 549/2004 (and the associated Airspace and FUA regulations) specifically do not extend to issues regarding military operations and national sovereignty, they do however facilitate the implementation of cross – border airspace structures and harmonization of FUA procedures.

EC regulation No 551/2004 of the European Parliament and of the Council on the organisation and use of the airspace in the Single European Sky states that:

"*...Member States shall ensure the uniform application within the Single European Sky of the concept of the flexible use of airspace as described by the ICAO and as developed by Eurocontrol.*"

During the planning process of the cross – border operations it has become evident that the application of the FUA concept differs significantly between (state A) and (state B). This CONOPS document and the supporting Letters of Agreement define a common application of the FUA concept in the area of common interest with regard to the cross – border operations. This will also ensure that the cross – border operations conform to the requirements of EC regulation 2150/2005 concerning joint use of common airspace.

1.3.2 EC FUA Regulation

FUA REGULATION (EC) 2150/2005 requires that the parties involved in cross – border activities:

"Article 3 Principles

...(d) Member States shall develop cooperation for the efficient and consistent application of the concept of flexible use of airspace across national borders and/or the boundaries of flight information regions, and shall in particular address cross-border activities; this cooperation shall cover all relevant legal, operational and technical issues"

This operational concept document aims to provide an outline of the required operational and technical procedures and requirements for the safe and harmonized implementation and use of cross – border airspace structures. The legal aspects of cross – border activities are agreed on a State level framework agreement and coordinated and monitored by the respective National high level airspace policy bodies in accordance with the national airspace charters.

1.4 Safety Assessment

1.4.1 Overall Structure

Differences in the current application of the flexible use of airspace concept in (state A) and (state B) have been identified during the planning process of the CBA implementation. Due to the nature of the CBA operations it is imperative that both countries apply the same set of rules and procedures in a uniform manner. Therefore it was decided that a joint safety assessment will be conducted by the participating service providers. The CBA related operations will be harmonized according to the findings of the safety assessment to ensure the safety of both the CBA operations and the impact of the CBA implementation on other components of the ATM infrastructure. The scope of the safety assessment shall be limited to the boundary of the CBA (excluding transit procedures to/from the area).

Safety assessments regarding operations within the areas shall be conducted as required by the respective military aviation authorities.

In as far as practicable having regards the specific nature of the change, the safety assessment will be conducted according to the requirements set in EC CR 2096/2005 *Risk assessment and mitigation in ATM.*

It will be submitted to the respective regulatory authorities for approval prior to implementation.

As can be seen in the diagram below this Safety Case is the overarching document.

The full assessment of the CBA will require two additional safety assessments so called Local Safety Cases (ANSPs).

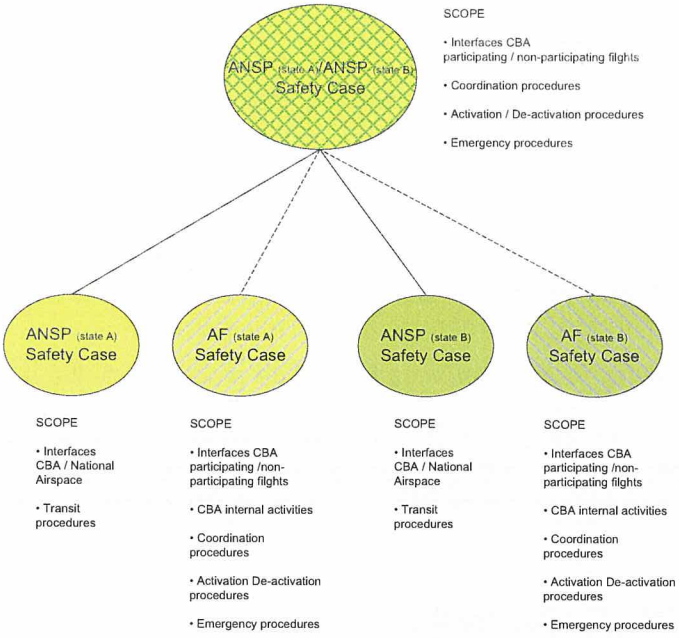

Figure 1- Overall safety cases relationship

Note: there are no binding provisions for military entities for what concerns the safety assessment activities described above.

1.4.2 Detailed Procedure

The detailed procedure is described in the document "Description of safety assessment process for the implementation of CBA" V1 Dated Feb 2010.

This proposed approach was accepted by Regulators (provide evidence).

2. SAFETY ARGUMENT

2.1 Aim

The aim of this safety case and associated safety assessment is to demonstrate that the safety of GAT airspace users under the responsibility of (ANSP A) and (ANSP B) will be ensured during the periods of activity of CBA.

2.2 Purpose (Justification)

The purpose of the creation of CBA is to fulfill the military Users (AF state A and AF state B) needs for adequate airspace to carry out their activities whilst limiting interference with GAT traffic under the responsibility of (ANSP A) and (ANSP B) to maximum extent possible.

2.3 Scope

This Safety Case addresses the safety issues at the interface between GAT outside the CBA and military activity in the CBA from ANSPs point of view.

Specifically the Safety Case does not address the following issues:

- Safety issues that are internal to the CBA
- MIL/MIL LoAs
- Transit procedures to/from CBA

Within that context this safety case covers the following system elements:

- Airspace;
- Equipment;
- Procedures; and
- Human.

2.4 Assumptions

It is assumed that Safety requirements (as identified and agreed during the safety assessment activities in the context of this Safety Case) to be implemented by Military entities will be carried out prior to the actual usage of the CBA. This covers, training of military staff to be delivered and technical equipment verifications to be done.

2.5 Participants

ATC supervisors, ATC controllers (military and civil), Fighter Controllers, Fighter Allocators, Engineers, Safety specialists, pilots with extensive experience, have participated to the workshop that took place to build the OHA/PSSA.

3. CONOPS

The CONOPS was produced through numerous iterations.

Extracts are shown below to ease the understanding of this Safety Case. For detailed information it should be referred to the CONOPS.

3.1 Airspace Definition

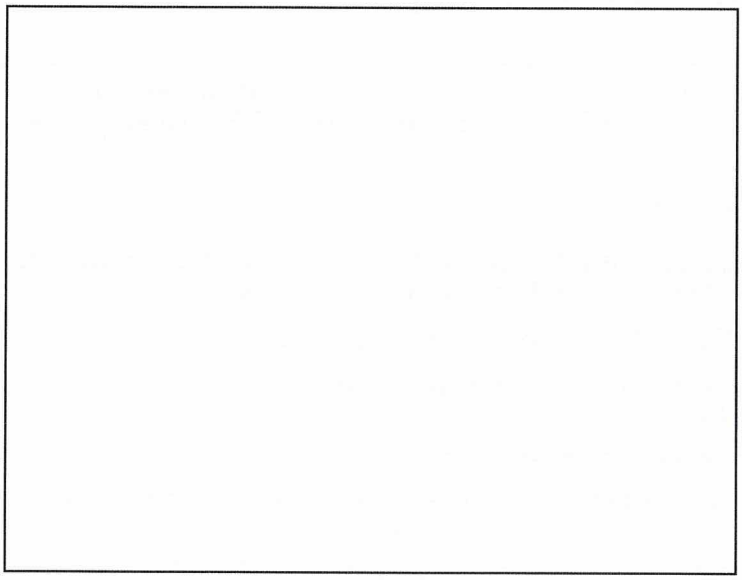

Figure 2 - Location of CBA

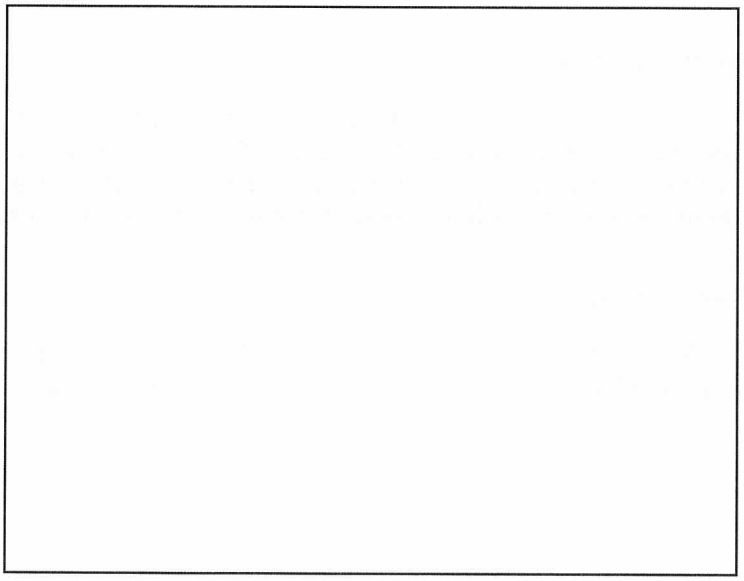

Figure 3 - CBA (name)

3.1.1 CONOPS

The CONOPS describes in details:

- The airspace definition;
- The ASM procedures (levels 1,2 and 3);
- Training;
- Concept acceptance;
- Other issues
  - Contingency;
  - Occurrence investigation;
  - Liability;
  - Reporting;
- Search and Rescue; and
- Minimum facilities.

3.1.2 LOAs

The following LOAs put in a form of legal agreement the provisions of the CONOPS:

- CAA (state A)/CAA (state B);
- ANSP (state A)/ANSP (state B);
- AMC (state A)/AMC (state B);
- ANSP(s)/FA FC;
- AMC(s)/CFMU
- Lead AMC/CFMU

And (although not within the scope of this safety case)

- AF(state A)/AF(state B) MoU and Technical arrangements.

3.2 Equipment

Technical equipment requirements have been captured in a Minimum Facilities List (see CONOPS for details).

3.2.1 Surveillance

For what concerns Surveillance means, a technical study/tests has been conducted in order to assess the consistency of the radar data at (ANSP state A) and (ANSP state B) ACCs, military radars from AF state A/AF state A as well as airborne equipment.

3.2.2 Communications

3.2.2.1 Air-Ground

VHF/UHF is known and adequate for normal operations (ref. coverage maps).

3.2.2.2 Ground-Ground

A COM plan has been established as shown in the technical synoptic below. Necessary technical modifications have been made and tested.

The COM Plan complies with ICAO requirements.

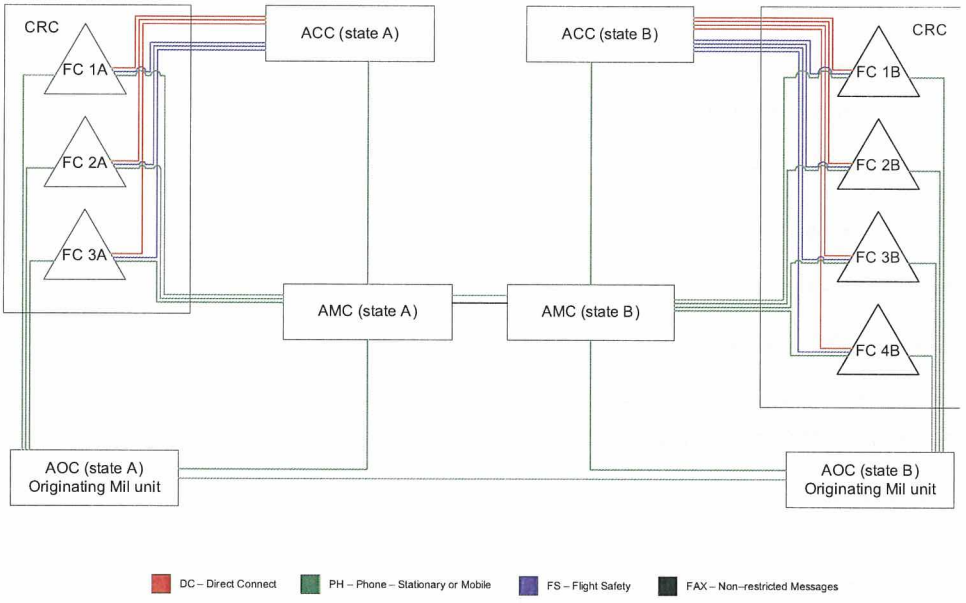

Figure 4 - COM Plan

3.2.3 Other Systems

3.2.3.1 OLDI

OLDI connections (FPLN and coordination data) required between ACCs plus verifying FPLN format acceptable by system.

3.2.3.2 Safety Nets

3.2.3.2.1 Ground

The ground radar safety nets performances and parameters are compatible with the CBA intended operations. However they will be subject of monitoring to verify that they do not degrade the level of safety in operations.

FLPN based warnings used for mitigation purposes.

3.2.3.2.2 Airborne

TCAS RAs will be subject of monitoring to verify that they do not degrade the level of safety in operations.

3.2.3.2.3 HMI (Example)

CBA will be displayed at CWPs in the same way as for other areas i.e. by manual input from the AMC FD assistant (state A) and by AMC (state B) through Watch Supervisor.

3.3 Human

3.3.1 Training

The following training requirements were identified at various steps of the project/safety assessment.

- ATCOs (information package, e-learning, classroom 1/2 day, 3 simulator runs);
- AMC (ATCO training plus 2 days theory-participation to dry runs);
- Supervisors (ATCO training plus 1/2 day theory); and
- Flight data operators (briefings).

The training requirements have been included in standard UTPs.

The training of military staff will be subject of an assumption.

- *AMC*
- *FC*
- *Pilots*

3.4 Environment of Operations

3.4.1 GAT Traffic on Affected Routes Environment of Low Traffic – Affected Airways

The main airspace structures affecting the area design with regard to CBA were:

- (list)

3.4.2 Services Provided

Both (ANSP state A) and (ANSP state B) provide radar services in the area concerned by CBA.

4. DOCUMENT LAYOUT

Section 5 presents a complete, high-level Safety Argument, covering the whole safety lifecycle, in order to provide a framework for the development of the Safety Case.

Sections 6 to 8 take each of the immediate sub-Arguments and present assurance (i.e. lower-level Arguments, together with supporting Evidence) to show that each of these (five) sub-Arguments is valid.

Section 9 presents the limitations associated with the safety assessment on which this Safety Case is based.

Section 10 provides for a recommendation.

Section 11 provides overall conclusions concerning the safety of the Concept, subject to the limitations presented in section 9.

Finally, definitions, abbreviations and list of references are provided in **sections 12, 13 and 14** respectively.

5. OVERALL SAFETY ARGUMENT

A high-level view of the safety argument structure is presented, in the form of Goal-Structuring Notation (GSN), in Figure 5 below.

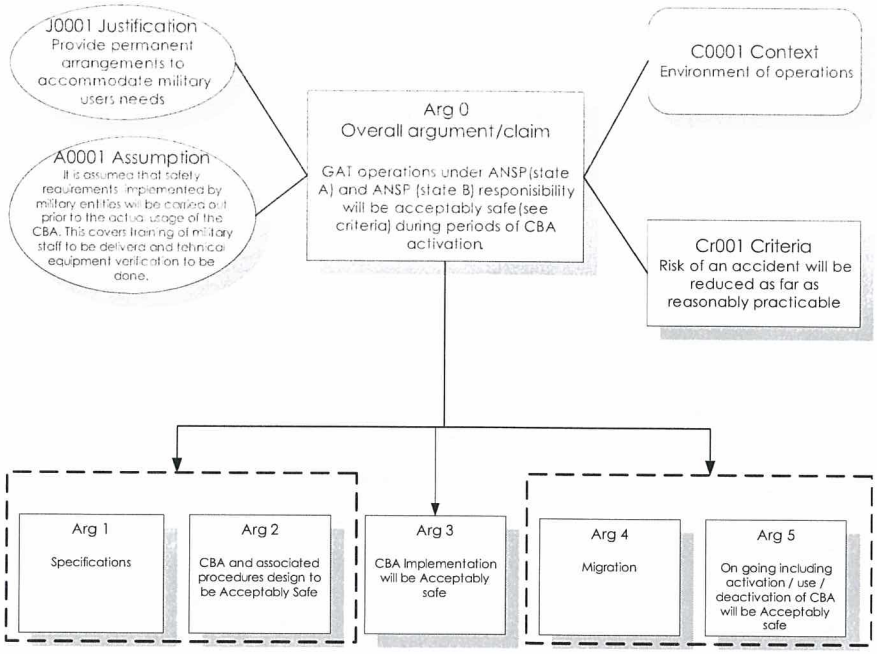

Figure 5 – Overall Safety Argument

5.1 Claim

Top-level Claim (**Arg0**) is "GAT operations under (ANSP state A) and (ANSP state A) responsibility will be acceptably safe during periods of CBA activation".

Arg0 is made within the context (**C0001**) of an operational context and a CONOPS (see Ref 0.) for complete description.

5.2 Safety Criteria

The main safety criteria are that the risk of an accident for the Concept shall be: "The risk of an accident will be reduced as far as reasonably practicable".

5.3 Strategy for Decomposing the Claim

The Claim is decomposed into four principal Safety Arguments, using the GSN convention that an Argument can be considered to be true, if (and only if) each of its immediate 'offspring' can be shown to be true.

Arg1 *asserts that the Concept has been specified to be acceptably safe, i.e. in this application this means "it takes due account of the needs of all parties involved".*

Note1: Arg1 in this case is not supported by an a priori assessment leading to specifications as is the case usually. The reason is that the user needs are directly translated into the design of the CBA (airspace), the procedures have been laid down by EUROCONTROL (FUA), the equipment required has been identified (Minimum facility List) as well as the impact on human knowledge, understanding and skills was also identified. For this reason it is merged with Arg2 "Design".

Arg2 asserts that the airspace has been designed so as to be complete, correct, and robust and its internal failures mitigated.

Arg3 asserts that the airspace, equipment adaptations, operational procedures and staff training have been implemented (completed) in accordance with the requirements identified under Arg1.

Arg4 *asserts that the migration to the usage by military forces of the CB) i.e. activation, operational usage and de-activation of the CB) will not affect the safety of GAT user under the responsibility of* (ANSP state A) *and* (ANSP state B).

Note2: *Due to the fact that the migration is not a permanent state i.e. until decommissioning, but a temporary change of airspace, migration may be considered as part of on-going operations. For this reason Arg4 is merged with Arg5 "On-going operations".*

Arg5 asserts that the provision ATS Services by (ANSP state A) and (ANSP state B) will continue to be shown to be acceptably safe in operational service. It is important to monitor operational safety to ensure that any problems that might arise in operational service are properly investigated and the appropriate corrective action taken. It is also the main means by which Safety Criterion 2) (see above) is addressed.

6. DESIGN (ARG1 & ARG2)

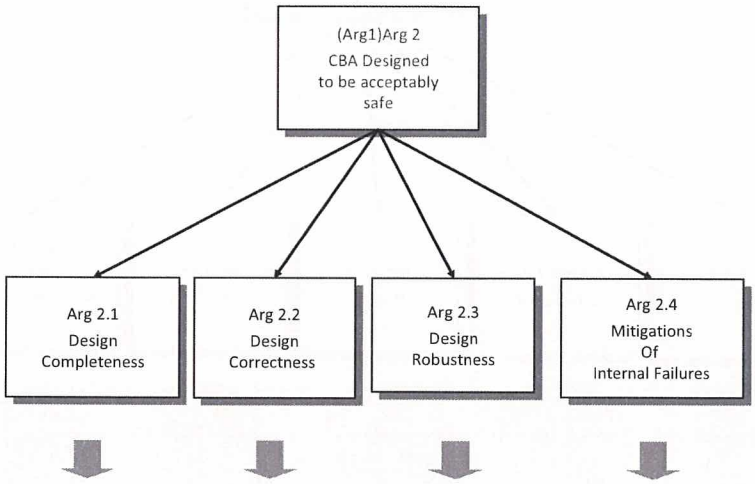

Figure 6 – Argument 2 (Arg 1 merged) CBA Designed to be acceptably safe

Argument 2 is decomposed in 4 sub argument addressing concept:

- Completeness;
- Correctness;
- Robustness; and
- Mitigations of internal failures.

6.1.1 Arg 2.1 Completeness

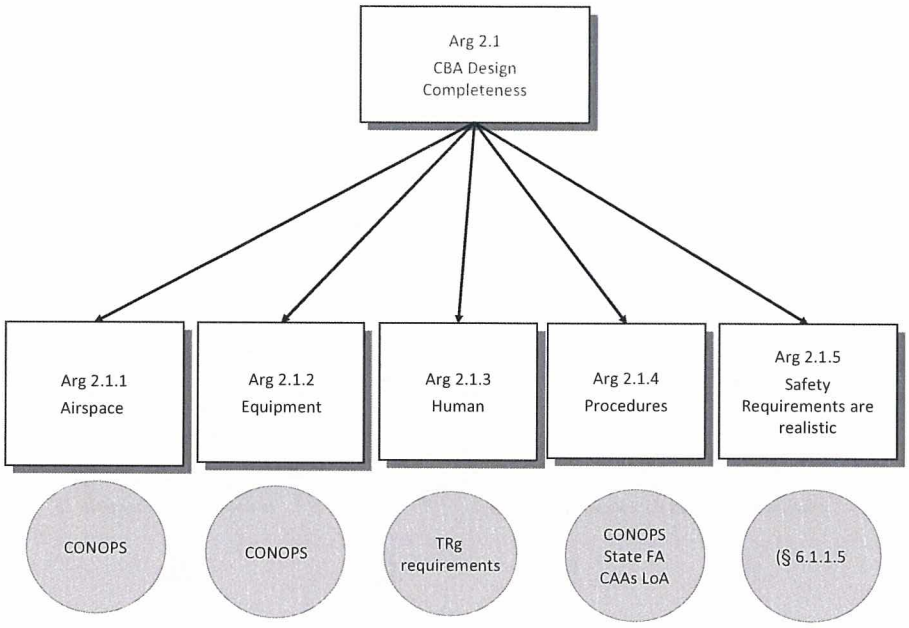

Figure 7 – Argument 2.1 CBA Design Completeness

Arg 2.1 asserts that design of the system which underlies the Concept is complete. The objective here is to show that Safety Requirements have been specified to cover everything, in terms of the system design, that is necessary to fully implement the Concept.

6.1.1.1 Arg 2.1.1 Airspace

Arg 2.1.1 asserts that the design of the airspace is complete.

This supported by the following elements:

- CBA position defined so as to have the lowest impact on GAT traffic whilst being at a acceptable distance from air bases;
- CBA vertical and lateral limits defined taking into account limiting airspace structures whilst satisfying the needs of the users in terms of airspace made available; and
- Design buffers defined through harmonisation. Buffers were increased to n NM (n NM inside the CBA and airways centreline defined n NM from CBA hedge). It is argued that these buffers are greater than recommended by ICAO and normal practice and therefore should provide better protection.

Note. Harmonisation was done by adopting the most constraining procedure/design from (ANSP state A) *or* (ANSP state B).

Evidence is available in the CONOPS.

6.1.1.2 Arg 2.1.2 Equipment

Arg 2.1.2 asserts that design of the required equipment is complete.

This supported by:

- Airborne equipment requirements; and
- Ground equipment Minimum facilities list and COM Plan.

Evidence is available in the CONOPS and attachments.

6.1.1.3 Arg 2.1.3 Human

Arg 2.1.3 asserts that "design" of the required staffing and staff training is complete.

This supported by identified training requirements. See § 3.1.4 above and CONOPS for what concerns roles and responsibilities.

6.1.1.4 Arg 2.1.4 Procedures

Arg 2.1.4 asserts that design of the required procedures is complete.

Procedures have been developed from the EUROCONTROL FUA procedures and their local application harmonised between ANSP (state A) and ANSP (state B).

- CAA/CAA LoA;
- ANSP (state A)/ANSP (state B);
- ANSP (state A)/AF (state A);
- ANSP (state A)/AF (state B);
- ANSP (state B)/AF (state B);
- ANSP (state B)/AF (state A);
- AMC (state A)/AMC (state B);
- AMCs/CFMU;
- Lead AMC/CFMU;
- Additionally OPS and TECH Manuals have been amended to reflect the provisions of the above documents relevant to operations.

and (although not within the scope of this safety case)

- AF (state A)/AF (state B) MoU, Technical arrangements and Cross Border Training Order.

6.1.1.5 Arg 2.1.5 Realism of Requirements

There is no issue with realism of the safety requirements as they all fall within types of activities that are normally carried out by civil and military ANSPs.

The table below summarizes these activities.

The table also shows the large difference in the level of preparedness and verification that permanent arrangements will provide i.e. a much safer environment of operations.

This provides for evidence satisfying Safety Criteria 1.

Num.	CBA Creation	Comments
1	Training and briefings	Comprehensive and fills gaps
2	COM plan	Compliant ICAO
3	COM operational checks	
4	SUR assurance	
5	SUR data consistency testing	Support buffer dimensioning
6	Alpha COM check	Ensures communications availability verification
7	OHA	Comprehensive review of operational hazards and mitigation
8	ANSP/ANSP LoA	Clarifies responsibilities
9	AMC/AMC LoA	Clarifies responsibilities
10	CAA/CAA LoA	Clarifies responsibilities
11	Detailed State/State agreement	Clarifies responsibilities
12	(MIL/MIL agreements) (*) not within the scope of this Safety Case	Clarifies responsibilities
13	CONOPS Document	Supports design, OHA and training
14	FUA procedures/Flow Charts for procedures	Supports design, OHA and training
15	Regulator approval	Provide further assurance
16	Safety Case	Provides evidence on all the above

6.1.2 Arg 2.2 Correctness

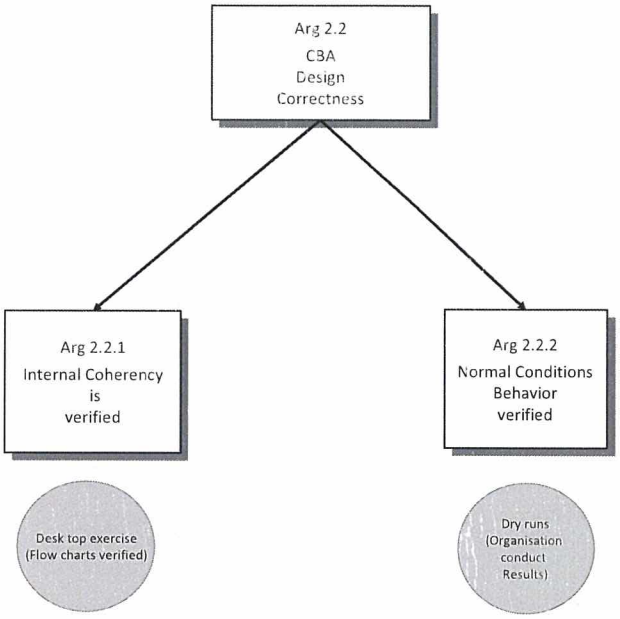

Figure 8 – Argument 2.2 CBA Design Correctness

Arg 2.2 asserts that the system design functions correctly and coherently under all normal environmental conditions. The main issues here are the internal coherency of the system, and the dynamic behaviour of the system, over the full range of conditions to which the system is expected to be subjected in its operational environment.

6.1.2.1 Arg 2.2.1 Internal Coherence

Arg 2.2.1 asserts that the internal coherency of the proposed concept has been verified.

This has been done through the use of flow charts to develop the FUA procedures applicable for the CBA and subsequent screening of the procedures.

Evidence can be found in OHA report.

6.1.2.2 Arg 2.2.2 Normal Conditions Behaviour

Arg 2.2.2 is supported by the demonstration that the concept works satisfactorily under normal conditions of operations i.e. in the absence of failures of any part of the system. This has been achieved by conducting "dry runs" i.e. CBA activated and deactivated but not actually used by participating aircraft so as to eliminate any risks.

6.1.3 Arg 2.3 Robustness

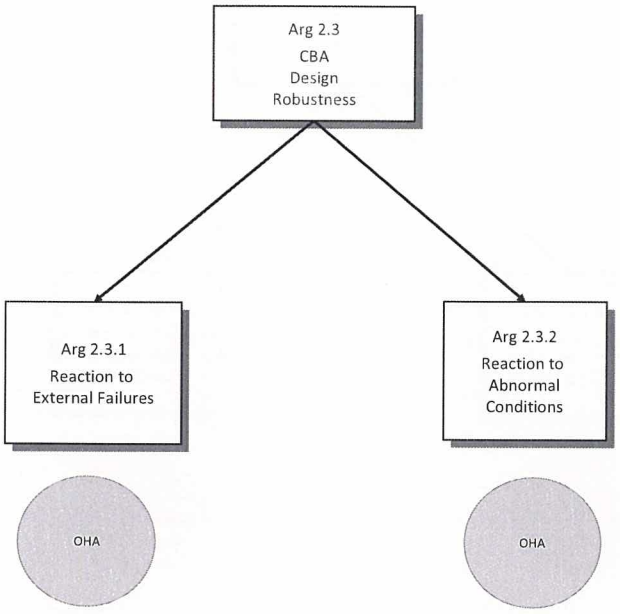

Figure 9 – Argument 2.3 CBA Design Robustness

Arg 2.3 asserts that the system design is robust against external abnormalities in the operational environment, from two perspectives: can the system continue to operate effectively; and could such conditions cause the system to behave in a way that could actually induce a risk that would otherwise not have arisen?

The robustness of the CBA(s) operations has been addressed during the OHA session.

Robustness related hazards were identified and classified as follows.

- External failures

GAT aircraft emergency leading to incursion into CBA either laterally or vertically (climb or descent) (list hazards in yellow and red categories)

- Abnormal conditions

Weather and of environmental conditions leading to lateral or vertical deviations of GAT aircraft into CBA (list hazards in yellow and red categories)

See also below classification of hazards.

6.1.4 Arg 2.4 Mitigation of Internal Failures

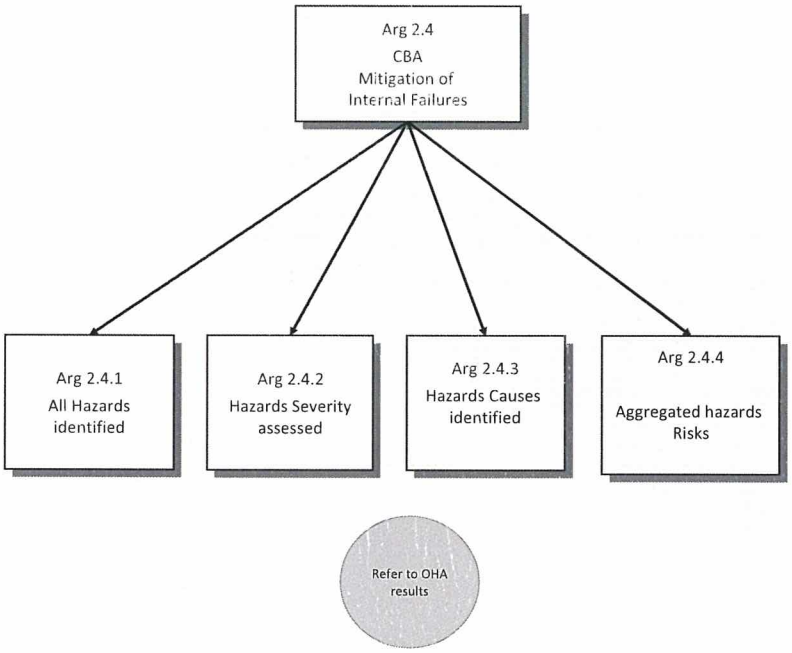

Figure 10 – Argument 2.4 CBA Mitigation of Internal Failures

Arg 2.4 asserts that all risks from internal system failure have been mitigated sufficiently. Here, the internal behaviour of the system is assessed from two perspectives, how loss of functionality could reduce the effectiveness of the system and how anomalous behaviour of the system could induce a risk that would otherwise not have arisen.

Note: the classification was based on the following tables.

Severity	Frequency (number of occurrences per air traffic control hour)				
	3.10-2<->5.10-3 (day/week)	5.10-3<->10-3 (week/month)	10-3<->10-4 (month/year)	10-4<->10-5 (year/10year)	10-5<->10-6 (> 10 year)
SC1 Accident					
SC2 Serious incident					
SC3 Major incident					
SC4 Significant incident					
SC5 No safety effect					

Table 1 Risk level and frequencies

The following table is proposed as acceptability criteria for decision makers.

Risk level	Category	Meaning
A	Unacceptable	The risk can not under any circumstances be accepted. It has to be reduced to a level which may be tolerable and preferably accepted.
B	Not desirable	Not desirable, but could in certain cases be tolerable after confirmation by *accountable management level* (provided that the risks has been reduced as low as reasonable practicable). The risk shall also be guarded so that it not increase over time and ends up on a higher level.
C	Acceptable	*No other means are necessary to reduce the risk*. The risk shall be overlooked so that it not increases over time and ends up on a higher level.

Table 2-Acceptability criteria

6.1.4.1 Arg 2.4.1, 2.4.2, 2.4.3

Identification of hazards and their causes lead to the following classification.

Hazard list

Incursion into CBA by civil aircraft

Hazards in the yellow area:

(List hazards in yellow and red categories)

Excursion out of the CBA by participating aircraft

Hazards in the yellow area:

(List hazards in yellow and red categories)

6.1.4.2 Arg 2.4.4 Overall Aggregation of Hazards

Severity 2	Severity 3
$X.10^{-X}$ per operational hour	$X.10^{-X}$ per operational hour
Equivalent to X incident every X years,	Equivalent to X incident every X year

6.1.5 Conclusions Arg1 & Arg2

Adequate evidence has been provided to support Arg 2.1 which asserts that design of the system which underlies the Concept is complete in that Safety Requirements have been specified to cover everything, in terms of the system design, that is necessary to fully implement the Concept.

Adequate evidence has been provided to support Arg 2.2 which asserts that the system design functions correctly and coherently under all normal environmental conditions (absence of failures or mistakes). The internal coherency of the system, and the dynamic behaviour of the system, have been demonstrated through dry runs.

Trustable expert judgement supports Arg 2.3 which asserts that the system design is robust against external abnormalities in the operational environment and Arg 2.4 which asserts that all risks from internal system failure have been identified and mitigated to a tolerable level.

7. IMPLEMENTATION (ARG3)

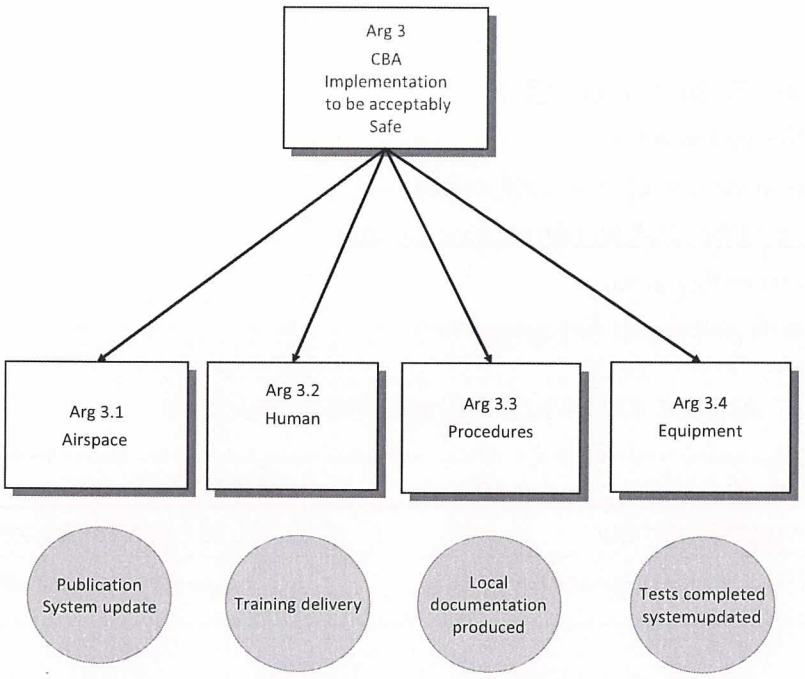

Figure 11 – Argument 3 CBA Implementation to be acceptably safe

Arg 3 asserts that the activities required to be completed prior to implementation of the Change have been carried out.

7.1.1.1 Arg 3.1 Airspace

Draft area data was provided to CFMU to verify consistency with CFMU Environment Database data.

CBA to be published at AIRAC dd/mm/yyyy and relevant information included in ANSPs OPS Manuals).

7.1.1.2 Arg 3.2 Human

Training has been delivered in compliance with training plans.

(ref Training records)

7.1.1.3 Arg 3.3 Procedures

Procedures have been incorporated as required in OPS and TECH Manuals and OPS/TECH documentation/maps (ANSPs).

Publication has been completed.

7.1.1.4 Arg 3.4 Equipment

The tests that were identified as required prior to going operational have been completed satisfactorily. (Surveillance, radio, telephones).

ATM systems have been updated and data cross-checked and maintenance procedures updated accordingly.

7.1.2 Conclusion ARG3

Adequate evidence support Arg 3 which asserts that the activities required to be completed prior to implementation of the CBA have been carried out.

8. ONGOING OPERATIONS (ARG4 & ARG5)

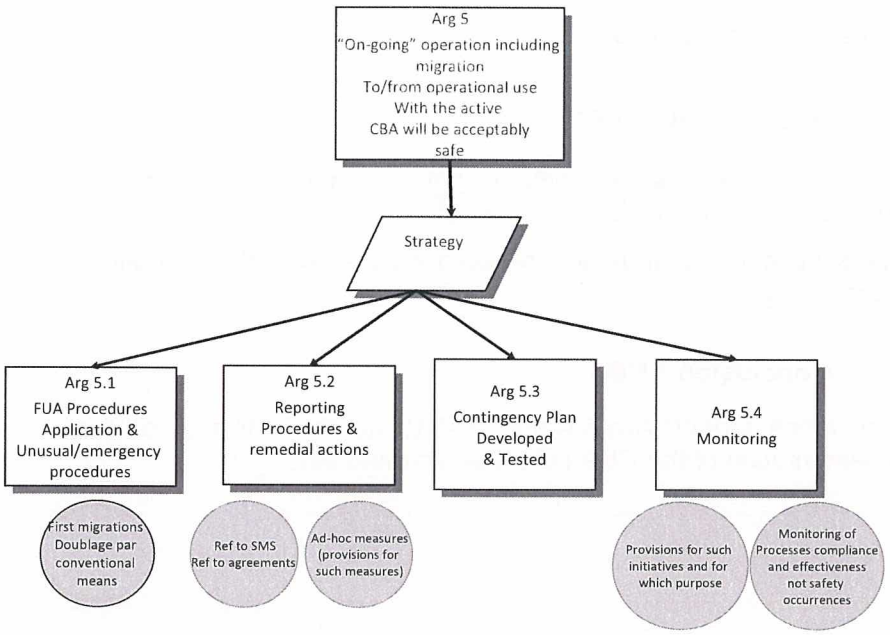

Figure 12 – Argument 5 (Arg4 merged) CBA Ongoing operation and maintenance including Migration to/from Operational use of the CBA will be acceptably Safe

Arg 5 asserts, in effect, that the Migration, i.e. activation, use and deactivation of the CBA the will not endanger the on-going operational service. It also asserts that the monitoring of the operational use of CBA will be sufficient to show that these operations are acceptably safe.

8.1.1 Arg 5.1 ASM Procedures First (Migration) Application

Should you feel it necessary, the first application(s) of the ASM Procedures (especially Level 3) could be subject of a "shadow operations".

8.1.2 Arg 5.2 Reporting and Remedial Actions

The reporting provisions are cared for in the following documents:

- CAA/CAA agreement
- ANSP/ANSP agreement reporting requirements

8.1.3 Arg 5.3 Contingency Plan

Contingencies affecting CBA activities have been designed. (Com lead AMC CFMU (LoA ANSP state A/ANSP state A/CFMU)).

8.1.4 Arg 5.4 Monitoring Requirements

The safety Case shall be maintained by dd/mm/yyyy.

When ever required by circumstances a team shall be re-activated to look at remedial actions that affect significantly the CONOPS.

1. Assumptions made herein (see § 2.4) require monitoring so as to verify the actual situation with regards their reality.

2. It is recommended to monitor the evolution of the GAT traffic levels on the affected roles so that significant increase is taken into account when assessing the need to revisit the hazard classification.

3. Having regards the participating aircraft performances characteristics it is recommended to monitor the behaviour of the airborne and ground based safety nets as to their possible impact of safety. (level of false or nuisance alerts and operators reactions).

4. Having regards the relatively complex procedures put in place it is recommended to monitor any hick-up or difficulty encountered even though no incident may have developed from it so as to possibly review and revise the procedures.

8.1.5 Conclusions Arg4 & Arg5

Adequate evidence support Arg 5 which asserts, in effect, that the Migration, i.e. activation, use and deactivation of the CBA the will not endanger the on-going operational service. It also asserts that the monitoring of the operational use of CBA will be sufficient to show that these operations are acceptably safe.

9. LIMITATIONS

The conclusions of this Safety Case are largely based on expert judgement as it could not be proceeded otherwise (no data available on CBA operations). Even if the selection of expert was carefully made this is nevertheless human experience based judgement.

It should therefore be acknowledged that the accuracy of the data provided herein is subject to the human limitations.

Adequate monitoring of operations as described above shall ensure necessary adaptations of the concept are made in due time.

10. RECOMMENDATIONS

(as identified)

11. CONCLUSIONS

Having regards the production of adequate evidence for each sub-argument and therefore the conclusive satisfaction of all sub-arguments and top level arguments it can be concluded that:

1. Operations during periods of activation of CBA under the foreseen permanent arrangements will be at least as safe as same operations conducted under temporary arrangements

AND

2. The risk of an accident will be reduced as far as reasonably practicable.

12. DEFINITIONS

For the purposes of the (state A) - (state B) cross border area concept of operations, the following definitions apply.

Common Area of Interest	Within the context of the CBA concept of operations; common area of interest refers to the CBA areas, the airspace below and above the areas, as well as adjacent airspace structures affecting or being affected by CBA.
Conditional route	A non-permanent Air Traffic Services (ATS) route or portion thereof which can be planned and used under specified conditions. According to their foreseen availability, flight planning possibilities and the expected level of activity of the possible associated areas (TSA/TRA), Conditional Route (CDRs) can be divided into the following categories: - Category One: Permanently Plannable CDR, - Category Two: Non-Permanently Plannable CDR, - Category Three: Non – Plannable CDR (N/A in the CBA concept)
Cross border area	A Temporary Segregated Area (TSA) or Temporary Reserved Area (TRA) established over international boundaries for specific operational requirements
Host ACC	The area control centre delegating the defined portions of airspace within its area of responsibility for the purposes of conducting cross border operations.
Host AMC	The national AMC managing the defined portions of the cross – border areas within its FIR/UIR for the purposes of conducting cross – border operations.
Host MIL - unit	The national MIL operator facilitating operations in the defined portions of airspace within its area of sovereignty for the purposes of conducting cross – border operations.
Lead - AMC	A pre-determined AMC responsible for the co-ordination with adjacent AMCs of the harmonized allocation of Cross Border Area (CBA) and/or the availability of specific Cross-Border CDRs.
Originating ACC	The area control centre providing air traffic services in the FIR/UIR of the originating AMC.
Originating AMC	The national AMC requesting the delegation of the defined portions of the neighboring FIR/UIR for the purposes of cross – border operations conducted.
Originating MIL - unit	The national MIL unit requesting CBA booking for the exclusive use of the respective state. In the case of joint exercises an originating MIL unit shall be nominated separately and will be considered as the focal point for the exercise planning and conduct.

13. ABBREVIATIONS

AMC	Airspace Management Cell	EC	European Commission
AUP	Airspace Use Plan	FUA	Flexible Use of Airspace
ANSP	Air Navigation Service Provider	GAT	General Air Traffic
AoR	Area of Responsibility	KPI	Key Performance Indicator
ASM	Airspace Management	LoA	Letter of Agreement
CAA	Civil Aviation Authority	NSA	National Supervisory Authority
CADF	Centralized Airspace Data Function	OAT	Operational Air Traffic
CBA	Cross – Border Area	TRA	Temporary Reserved Area
CBO	Cross – Border Operations	TSA	Temporary Segregated Area
CRC	Control and Reporting Center	UUP	Updated Airspace Use Plan

14. REFERENCES

Nber	Reference
1	Generic CBA CONOPS ver. 0.1 dated 06/2011
2	EC 549/2004 FUA procedures
3	EC 550/2004 SES
4	EC 2150/2005 Joint Use of Airspace
5	EC 2096/2005 Risk assessment and Mitigation in ATM
6	"Description of safety assessment process for the implementation of CBA" ver 1.0 dated 02/2010
7	Generic OHA for CBA ver. 0.2 dated 06/2011

(***)