SAM ATSRO/3

INTERNATIONAL CIVIL AVIATION ORGANIZATION
South American Regional Office

Regional Project RLA/06/901

FINAL REPORT

THIRD SAM WORKSHOP/MEETING ON ATS ROUTES NETWORK OPTIMISATION

(SAM ATSRO/3)

(Lima, Peru, 4 to 8 July 2011)

INDEX

HISTORY OF THE MEETING

ii-1 PLACE AND DURATION OF THE MEETING

The Third SAM Workshop on ATS routes network optimisation (SAM ATSRO/3) was held at the ICAO SAM Regional Office, Lima, Peru, from 4 to 8 July 2011, with the support of Regional Project RLA/06/901.

ii-2 OPENING CEREMONY AND OTHER MATTERS

Mr. Franklin Hoyer, Regional Director of the ICAO South American Office, greeted the participants, and highlighted the importance of the issues to be dealt with. He also thanked the participants and aeronautical authorities and international organisations for the participation in this important event and highlighted the success obtained with the implementation of Version 01 of the ATS routes network in March 2011. Further, he inaugurated the meeting.

ii-3 SCHEDULE, ORGANIZATION, WORKING METHODS, OFFICERS AND SECRETARIAT

The Meeting agreed to hold its sessions from 0900 to 1530 hours, with appropriate breaks. The work was done with the Meeting as a Single Committee, contemplating the creation of Ad-Hoc Groups to deal with some items of the agenda, if deemed appropriate.

Mr. Daniel Movsesian, from the Delegation of Argentina, was unanimously elected as President of the Meeting, and Mr. César Varela, from Bolivia, was elected as Vice-Chairman of the Meeting. Mr. Celso Figueiredo, RO/ATM/SAR acted as Secretary, being assisted by Messrs. Roberto Arca, RO/AIM/SAR/ATM, both from the SAM Regional Office, and by Mr. Jorge Fernández Demarco, ATM Adviser, SAM Regional Office. Also, Messrs. Julio César de Souza Pereira, José Tristão Mariano, and Bolívar Dávalos, from the delegations of Brazil and Ecuador, respectively, moderated the Ad-Hoc Groups related with the different agenda items.

Also, the meeting had the opportunity to acknowledge through a presentation of the Brazilian delegation, the methodology used for airspace optimisation and the routes network of that States and was informed on the actions taken by Argentina through its Crisis Committee, to manage airspace during and after the volcanic eruption in the Piyahue-Caulle system, which affected several States of the Region. The meeting thanked the excellent presentation of Brazil and congratulated Argentina for the actions taken to face the crisis, due to volcanic ashes.

ii-4 WORKING LANGUAGES

The working language of the Meeting were Spanish, and its relevant documentation was presented in Spanish and English.

ii-5 AGENDA

The following agenda was adopted:

Agenda Item 1: Review of the ATS routes network Optimisation Programme

Agenda Item 2: Analysis of Version 02 of the SAM ATS routes network

Agenda Item 3: Other matters

ii-6 **ATTENDANCE**

The meeting was attended by 11 States of the SAM Region, Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Panama, Paraguay, Perú, Uruguay and Venezuela, one International Organisation, IATA, making a total of 24 participants. The list of participants is shown in pages iii-1 to iii-7.

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Agenda Item 1: Review of the ATS routes network optimisation programme

1.1 Under this agenda item, the Meeting reviewed the SAM route network optimisation programme and its corresponding action plan, which were initially approved at the SAM/IG/3 meeting (**Conclusion SAM/IG/3-1)** and, according to the action taken, should be implemented in phases in order to obtain major operational benefits as soon as possible.

1.2 The Meeting recalled that this programme was to be implemented in three different phases: Phase 1 – Implementation of RNAV-5; Phase 2 – Implementation of Version 1 of the SAM ATS route network; and Phase 3 – Implementation of Version 2 of the SAM ATS route network.

1.3 The States took note that the SAM/IG/7 meeting held in Lima on 23-27 May 2011, with respect to **Phase 1** of the programme concerning the implementation of RNAV 5, scheduled for September 2011, had decided to postpone it until **20 October 2011**.

1.4 Regarding **Phase 2** of the programme, involving Version 1 of the ATS route network, the Meeting was informed that this phase had been completed satisfactorily in March 2011, as scheduled, with the implementation of 15 new RNAV routes, the realignment of 19 routes and the elimination of 18 conventional and RNAV routes. It also took note of the main efficiencies derived from fuel **savings** according to a predictive calculation made jointly with IATA during a period corresponding to 13 AIRAC cycles, which, based on a price of U$S 1,06 per gallon of fuel, exceeded **U$S 7'600,000**, and of environmental benefits of more than **22'600,000 kg of CO_2** resulting from reduced emission of pollutants. The methodology, tools and template used by IATA for this predictive calculation are described in the report of agenda item 2 of the SAM/IG/7 meeting.

Results of the implementation of Version 1 and lessons learned

1.5 The Meeting recalled that during the process of implementation of Version 1 of the ATS route network, some difficulties and other aspects were identified that should be taken into account when analysing Version 2 of the ATS route network, namely:

a) The route network should fully respond to the requirements of all users (civil, military, general aviation, UAS, etc.) and should be established in such a way as to allow most flights to operate direct routes or as close as possible to them, between their points of origin and destination.

b) Optimum capacity must be achieved, taking into account the need to reduce the complexity of airspace structure.

c) Better airspace sectors should be achieved in order to optimise ATC capacity, including the possibility of delegating ATS functions.

d) It should be possible to reduce controller workload through airspace reorganisation and partitioning in sectors as necessary.

e) Define the type of route (unidirectional/bidirectional) and the direction of unidirectional routes, taking into account the need for a more efficient partitioning in sectors.

f) Resolve civil/military coordination deficiencies to ensure the efficiency of the route network.

g) Permit the application of the flexible use of airspace (FUA) concept to make sure that the requirements of all airspace users are met.

h) Permit integration with the State domestic route network.

i) Eliminate or reduce points of congestion, where possible.

j) Maintain the number of ATS routes as low as possible, always taking into account traffic demand in relation to ATC capacity, and the possibility of applying direct routes.

k) Keep the number of crossings as low as possible, and where crossings are necessary, they should be planned so as to avoid congested sectors.

l) Avoid redundant ATS routes.

m) Airspace planners in coordination with procedure designers should ensure compliance with ICAO SARPs and, where appropriate, that air navigation data incorporates the information contained in Amendment Nº 3 of Doc 8168, Vol. 2, PANS-OPS.

n) Consider using unidirectional routes, especially in areas where the interaction of climbing/descending traffic is a limiting factor.

o) Consider the use of parallel routes in areas where there is a need to increase airspace capacity, applying RNAV 5.

p) States should avoid isolated actions aimed at restructuring of airspace or domestic ATS route networks, which might have a significant impact on traffic beyond the area under the jurisdiction of the State concerned.

q) Administrations should comply with the dates agreed for publication of amendments to their respective AIPs; otherwise, the implementation of the route network on the agreed date could be compromised, thus creating a safety hazard.

r) Define, in addition to the effective date of implementation, a common schedule that is convenient to all States for the implementation of Version 2 of the ATS route network.

s) The working group on ATS routes should set a target date, duly in advance, for receiving optimisation proposals, thus enabling States and users to duly prepare their implementation plans.

t) Airspace delegation among States.

1.6 Regarding the airspace delegation among States, the administrations of Argentina, Brazil and Uruguay described their experience to the Meeting. In this regard, and with a view to reducing the workload of both controllers and pilots, they had agreed to an airspace assignment in the segment of route UM402 between SEKLO and KIMIK. The corresponding letter of agreement between the respective administrations is pending revision and updating, for submission at the SAM/IG/8 Meeting.

1.7 Regarding the development of **Phase 3**, involving the implementation of Version 2 of the ATS route network, States were informed that the SAM/IG/7 meeting had reviewed and made adjustments to the planning of pending tasks of its Action Plan for the implementation of **Version 02** of the ATS route network.

1.8 The Meeting, taking into account that Phase 3 should entail a complete restructuring of the route network, aimed at full integration between ATS routes, control sectors, TMAs, etc., by virtue of the flexible use of airspace concept, analysed in detail the adjustments made by the SAM Implementation Group at its last meeting. Following a fruitful debate that took into account the opinion of users and air navigation service providers, the Meeting agreed to approve the modifications and to introduce the improvements to the Action Plan, Phase 3, Version 02 of the SAM ATS route network optimisation programme.

1.9 In view of the above, the Meeting agreed to formulate the following conclusion:

Conclusion ATSRO/03/01 **Action plan for the implementation of Version 2 of the ATS route network optimisation programme**

That SAM States take into account; incorporate into their national plans, and implement, the action plan for Version 2 of the ATS route network optimisation programme shown in **Appendix A** to this part of the report.

1.10 Likewise, when reviewing the proposed modification of the action plan of the regional optimisation programme for the implementation of Version 2 of the ATS route network, the Meeting highlighted the complexity of its implementation, which required the introduction of some new activities to prepare the Region for the implementation. Furthermore, some tasks had to be modified, and the start and completion dates of some of them were adjusted.

1.11 Amongst the new activities, much importance was assigned to the holding of a seminar/workshop on airspace planning, aimed at preparing airspace planners of the States of the Region. It was agreed that the activity could be carried out on the last week of February 2012. For the completion of this task, the Secretariat was requested to study the possibility of providing assistance, through Project RLA/06/901, and to request the cooperation of DECEA of Brazil through the assignment of two experts on this topic. It also requested other States and organisations to study the possibility of supporting this event.

1.12 The Meeting also made plans to hold the fourth and fifth SAM workshop/meetings on ATS route network optimisation, in 2012 and 2013, respectively, with the support of Project RLA/06/901, if possible.

1.13 The Meeting, given the extent of optimisation in Phase 3, Version 02, took note of the importance of conducting studies on "airspace modelling" and "accelerated-time simulation" within the action plan in order to assess the scenarios developed. This tool is available only in Brazil; accordingly, the Secretariat was requested to study, together with the aeronautical authority of Brazil, the feasibility of conducting this study during the second half of 2012. In case this was possible, support would be requested from Regional Project RLA/06/901 for the participation of two experts from States of the Region.

1.14 The Meeting also noted that, once the scenarios had been defined and Version 2 of the ATS route network had been identified, the workshop/seminar would need to be held in 2013 to analyse the corresponding risk, for which the support of Regional Project RLA/06/901 would also be required.

1.15 In view of the above and of all the activities to be carried out prior to the implementation of Version 2 of the route network, it was concluded that the most appropriate date for implementation would be 17 October 2013.

1.16 In this sense, based on the work done for the analysis of the routes to be implemented in Version 2 (see paragraph 2.48 and subsequent paragraphs of the report on agenda item 2), the Meeting discussed the proposed date and the regional route optimisation programme itself.

1.17 According to IATA, the proposed date was unsatisfactory, since some routes that had been assessed by the ATS route ad-hoc group were expected to continue being implemented, and although a date had not been established, it was expected to be as soon as possible, given the significant benefits to be derived from reduced fuel consumption and CO_2 emissions, and the fact that it would not be appropriate to wait so long to obtain such benefits.

1.18 In this sense, it was recalled that the ATS route network optimisation programme had been approved at the SAM/IG/3 meeting by all States and users, including IATA, with the support of Project RLA/06/901. It was also recalled that the programme had as its philosophy to contribute to the achievement of ICAO strategic objectives in terms of safety and environmental protection, to which end, some planning criteria, techniques and principles had to be taken into account and an airspace concept established. Following an analysis and diagnosis of the SAM ATS route network, the Meeting agreed that the programme should be implemented in phases in order to obtain the corresponding operational benefits as soon as possible.

1.19 Starting in Phase 2, implementation of Version 1 (March 2011), the route network version concept would be incorporated, taking into account that airspace structure changes depending on air traffic growth, the displacement of air traffic demand from one region or airport to another, available technology, amongst other aspects.

1.20 The use of route network versions entails the need for a periodic and integrated review to ensure the best possible airspace structure at all times. The implementation phases, with their corresponding activities, are shown in the SAM ATS route network optimisation programme, contained in Appendix A to this part of the report.

1.21 In view of the foregoing, the early implementation of some routes that could benefit the system, but that could have a long-term negative impact on the optimisation programme should be avoided, since it could jeopardise the attainment of an integrated route network from which even greater benefits would be derived, except in specific cases where safety might be compromised.

1.22 Following an intense debate on the topic, and recognising that it was not possible to make a decision since the optimisation programme had been approved during the meetings of the SAM Implementation Group within the framework of Regional Project RLA/06/901, the Meeting considered that any modification o amendment to this programme should be proposed in working papers describing the appropriate elements, and submitted to the consideration of the States and/or users at the SAM/IG/8 meeting to be held in October 2011.

1.23 Accordingly, it was agreed that the programme and its associated action plan, as modified by this Meeting, should be submitted to the SAM/IG/8 meeting, where States and users would be able to submit substantiated proposals of amendment to the programme and to the action plan for analysis.

1.24 However, the Meeting considered that the activities related to the new ATS routes, as analysed by the Group, should be conveyed to each Administration in order to continue studying the possibility of early implementation, and that a decision in this regard be made at the SAM/IG/8 meeting.

1.25 IATA proposed the implementation of some routes that had been transferred from Version 1 for analysis in Version 2 which implementation that had been expected - from IATA point of view - for early implementation.

1.26 Following a debate amongst the various States, a delegate proposed that the draft amendment to the regional optimisation plan be submitted to the SAM/IG/8 meeting. The Meeting agreed with the proposal, thus ending the discussion of this subject.

Programme for Optimising the ATS Route Network in the South American Region

Version 02

July 2011

1. Introduction

The main objective of the Airspace Organisation and Management (AOM) component of the Global ATM Operational Concept is to maximise efficient airspace use, while maintaining the required level of safety.

Incorporation of the Global ATM Operational Concept into the Global Air Navigation Plan facilitated the planning and implementation of new and innovative methods that make significant improvements in airspace organisation and management possible. The set of Global Planning Initiatives (GPI) directly involved in AOM offer the necessary guidelines for planning and implementing an optimum airspace structure, among the most important of which are:

a) GPI 1 –Flexible Use of Airspace

b) GPI 5 – RNAV and RNP

c) GPI 7 – Dynamic and Flexible ATS Route Management

d) GPI 8 – Collaborative Airspace Design and Management

e) GPI 10 – Terminal Area Design and Management

f) GPI 11 – RNAV and RNP SIDs and STARs

PBN implementation (GPI 5) will facilitate the use of advanced aircraft navigation capabilities, which, combined with the air navigation system infrastructure, will make it possible to optimise the airspace, including the route network. This will favour ATS routing that will meet the needs of airspace users, thereby reducing controller and pilot workloads and the concentration of aircraft in specific portions of the airspace.

Recognising the importance of PBN for AOM, the 36th ICAO Assembly established Resolution 36/23 urging States to implement ATS routes and RNAV and RNP approach procedures, based on the PBN Manual (Doc. 9613). The 36th Assembly also resolved that States and Regional Planning and Implementation Groups (PIRGs) should prepare a PBN implementation plan by 2009.

Before approving the Global ATM Operational Concept and the new Global Air Navigation Plan, CAR/SAM States, Territories, and International Organisations reviewed the ATS route network and implemented new RNAV routes, with the assistance of Project RLA/98/003 through its support for meetings of ATM authorities and planners --ATM (AP/ATM)-- , thereby helping to reduce some paths, leading to a compatible transition between the en-route flight phase and terminal control areas. It also made it possible to develop the CAR/SAM PBN Route Map, approved through GREPECAS/14 Conclusion 14/46.

As a result of the efforts of States with the support of project RLA 98/003, 77 RNAV routes have been implemented, the flight paths of 58 routes have been modified, and 7 routes have been eliminated. The ICAO Council has approved the respective amendments to the CAR/SAM ANP Route Network.

At the request of States and International Organisations, the ICAO regular programme has, among other implementation projects, focused its attention on optimising the ATS route network. In this respect, the meetings of the SAM Implementation Group (SAM/IG) are being held under the auspices of the new RLA 06/901 project. One of the aims of these meetings is to optimise the ATS route network in the South American Region. During its first two meetings, the SAM Implementation Group (SAM/IG/1 and SAM/IG/2) analysed the current state of the route network and confirmed the following:

a) Some routes have not met expectations as to their use by operators, despite the insistence of the latter on their implementation;

b) It was noted that some routes, although duly implemented, are in little use because the operators prefer less direct ATS routes, which result in higher operating costs and, in some cases, less airspace capacity and flexibility;

c) A large number of RNAV routes have not yet been linked through the SID and STAR procedures established in the TMAs, making flight and ATC operation difficult;

d) Airspace complexity is more related to air traffic movement than to airspace design *per se*. As a result, in some cases, routes with low traffic could be maintained so long as the corresponding operational benefits are obtained.

The SAM Region has seen the need to further improve the airspace structure, in order to achieve an inter-functional air traffic management system available to all users during all flight phases, that meets the agreed safety levels, provides cost-effective operations, is environmentally sustainable, and comply with national security requirements.

In order to achieve the above, the SAM/IG/2 meeting deemed it appropriate to conduct a feasibility study to develop an ATS route network that would meet the new aviation requirements and provide for the new performance-based navigation concept.

Considering the diversity of scenarios in the Region, the Meeting felt that this task would be very complicated and should be supported by the Regional Project RLA/06/901, in order to first make a diagnosis of the existing ATS Route Network, develop a strategy for carrying out the task in phases, if appropriate, prepare a list of deliverables, propose a work programme, identify the data needed and the means for their collection, define the necessary support tools to perform the task, specify the reference documentation required, and other aspects deemed relevant for the task, such as the interests of each State, geographic characteristics, etc. In addition to the aforementioned aspects, safety issues and other expectations described in the Global ATM Operational Concept should be taken into account.

Optimising the ATS route network in the South American Region is expected to contribute to the accomplishment of the following Strategic Objectives of ICAO:

A: Safety — *Enhance global civil aviation safety*

C: Environmental protection — *Minimise the adverse effect of global civil aviation on the environment*

D: Efficiency — *Enhance the efficiency of aviation operations*

2. Planning criteria

2.1. General Considerations

This chapter of the programme was based on the EUROCONTROL Manual for Airspace Planning (ASM.ET1.ST03.4000.EAPM.02.02), which can be obtained at the following website address:http://www.eurocontrol.int/airspace/gallery/content/public/EUROCONTROL%20APM%20V2_Ed-2_Released%20Issue_Amendment%202_010606.pdf. Those interested in deepening the analysis contained in this chapter are recommended to refer to that document.

The ATS route network should serve as a basis for airspace organisation and air traffic service requirements. It should be established in such a way as to permit most flights to operate on direct routes, or as close to such routes as possible, in order to unite flight origin/destination areas. This structure must be operationally viable. In order to achieve optimum ATC capacity, it may be necessary to establish non-optimum flight levels and/or paths, but this could reduce the complexity of the airspace structure.

There is a very close relationship between the route network structure and airspace sectorisation. Therefore, that relationship should be considered as of the planning phase, in order to ensure the viability of sectorisation that would make optimum ATC capacity possible, including the possibility of ATS delegation. Definition of the route type (one-way/two-way) and the direction of one-way routes can take into consideration the need for more efficient sectorisation. In more complex airspace structures, validation through ATC simulations may be necessary before implementation.

Civil/military coordination is essential to ensure route network efficiency. The flexible use of airspace (FUA) concept is of key importance for guaranteeing that the requirements of all airspace users are met. FUA application permits the implementation of additional direct routes, as of the moment direct aircraft routing practices are adopted at the ATC tactical level, in cases where temporary special use airspaces (SUA)[1] are not activated. Automatic flight plan reprocessing may facilitate FUA application, permitting flight planning, if information about SUA availability for civil aviation is made viable sufficiently in advance.

Definition of the main traffic flows should include domestic air traffic routes and segments, in order to make the development of an integrated structure possible in the initial planning phase. Efforts should be made to eliminate points of congestion. In that case, special care should be taken to avoid worsening the situation of one area when attempting to resolve problems in another area.

The number of ATS routes should be kept to a minimum, always considering the traffic demand in relation to ATC capacity and the possibility of applying direct routes. Utilisation of a large number of ATS routes improves the possibility of using direct routes. Having a large number of crossing points, however, especially in areas that are already congested, normally reduces ATC capacity, in accordance with growing airspace complexity. Airspace planners should optimise ATC capacity by introducing new routes with the least number of crossing points possible and/or inserting the crossing points as far from the congested areas as possible. In that way, if the implementation of a new route is planned to accommodate a foreseen demand in air traffic that is not confirmed during the implementation phase, its implementation should be reconsidered. Furthermore, redundant ATS routes should be eliminated.

The use of one-way routes should be considered, particularly in areas where the interaction between ascending/descending traffic is a limiting factor, and represents an advantage in improving airspace structure that will lead to increased ATC capacity in ATC sectors. Likewise, in congested areas, aircraft overflights should not, insofar as possible, cross each other or interfere with the arrival and departure flow of the main TMAs, and the duration of possible crossings should be minimised and preferably carried out at 90º angles.

2.2. Use of Performance-Based Navigation

The use of Performance-Based Navigation creates the necessary conditions for optimising the ATS route network, inasmuch as it makes it possible to harmonise aircraft and operator approval criteria for en-route RNAV operations and permits the establishment of appropriate route spacing with the application of the Protected Airspace Concept. With PBN implementation, the airspace can be made less complex through the elimination of conventional routes, reduction of crossing points between flight paths, and orderly arrangement of the airspace as a whole.

[1] Special Use Airspaces are those provided for in Doc 8126 (AIS Manual), which should be inserted in the ENR part of the AIP of each State, as follows:
ENR 5.1 –Restricted / Prohibited / Dangerous Areas
ENR 5.2 – Areas for Training and Military Exercises / Air Defence Identification Zones (ADIZ)
ENR 5.3 – Other Dangerous Activities and Other Potential Risks

2.3. Regional Routes and Domestic Routes

In airspaces where international operations are responsible for most of the traffic, development of the route network requires coherent coordination among the States involved. In airspaces where most of the air traffic consists of domestic operations, the route network must be harmonised with the adjacent States, in order to optimise the airspace structure.

Isolated State development of domestic ATS routes should be limited to airspaces that serve national purposes only. In addition, such efforts normally have direct and perceptible effects on air traffic beyond the jurisdiction of the State involved.

Development of a harmonised and consistent route network requires active participation by States in the international working groups formed to establish or review the regional route network, considering a top down strategy, based on regional operational requirements for increasing ATC capacity, bearing in mind the following criteria:

a) First, identify the main regional air traffic flows, together with those that extend beyond the Region and have a direct impact on the regional route network, in order to seek out shortcomings in the route network and in ATC sector organisation.

b) Establish and review the ATS route network and support sectorisation in order to accommodate the main air traffic flows, thereby reducing airspace complexity and balancing ATC workload.

c) Integrate the required routes to provide access to the regional route network from/to airports not served by it. It is also necessary to integrate non-permanent routes that are needed to alleviate the air traffic load in the main ATS routes and to ensure flight at the most optimum profile possible.

d) Ensure connectivity between the ATS route network from/to TMA airspace.

e) Establish phased implementation to ensure consistency with State implementation.

2.4. Relationship between ATS Routes and Control Areas (CTA)

Use of Control Areas (CTA) in significant portions of the airspace beyond the ATS routes has the advantage of allowing the controller, when air traffic conditions permit, to authorise a specific flight under his/her control to deviate from an established ATS route without having the aircraft leave the controlled airspace and without losing the ATC benefits.

Within the CTA, however, the protected airspace of ATS Routes is not visible, because, by definition, all airspace around the routes is controlled airspace and this does not facilitate the demarcation of special use airspace (SUA) adjacent to ATS routes. On the other hand, establishing ATS routes in the form of corridors (airways) offers a clear description of the associated protected airspaces, within which controlled flights should remain.

To give flexibility to VFR flights outside airways and TMAs, the lower limits of controlled airspace must be established in order to avoid unnecessarily restricting flights that do not require air traffic control services, while keeping IFR traffic within the controlled airspace during the departure, en-route, arrival and approach phases.

2.5. Flexible Use of Airspace (FUA)

Most ATS routes must be established on a permanent basis. There are cases, however, in which the application of non-permanent routes, in keeping with the existence of temporary special use airspace (SUA), can make it possible to optimise the airspace structure, either reducing the traffic load on the main routes or permitting flights at more convenient profiles.

By way of example, EUROCONTROL has established Conditional Routes (CDRs), according to a specific classification for each operational situation:

a) CDR 1 – Routes that can only be used during specific periods, for example, during weekends or at night. These routes can be used permanently for flight planning purposes during the periods specified in the AIP. Changes in periods specified in the AIP should be published through standard AIS procedures.

b) CDR 2 – Routes that can be used through pre-tactical coordination procedures established by the Airspace Management Control (AMC) units. These routes can be used for flight planning, but not permanently, depending upon AMC coordination. They normally depend upon the capacity for reprocessing flight plans.

c) CDR 3 – Routes that can be used tactically by the ATC unit through direct coordination between the ATC and the user of the special use area. These routes are not used for flight planning purposes.

ATS routes used under the Flexible Use of Airspace concept should be included in the ATS route network, with a clear indication of the limitations imposed by their non-permanent nature. These routes should be reviewed at regular intervals in order to assess their type (1, 2 or 3), whenever fuller use of these routes is needed.

2.6. Protected Airspace – Route Spacing Concept

Item 2.11 of Annex 11 establishes the requirement to provide protected airspace and adequate spacing between adjacent ATS routes. This spacing between the centre lines of parallel runways where PBN is applied depends upon the type of RNAV or RNP specified by each State or on the basis of regional agreements.

In the case of RNAV-5 (B-RNAV) application in Europe, the minimum route spacing was established at between 10 and 15 NM, depending upon whether or not radar was used and ATC intervention capacity.

Route spacing should be assessed as provided for in Doc. 9689, bearing in mind, among other aspects, the available ATS surveillance capacity and air traffic controller workload.

2.7. Harmonisation in route network publication

Doc 8126 (AIS Manual) recommends that part ENR 3 of the AIP contain a list of all ATS routes established within the territory of a State, whether as part of the Regional or of the National Route Network.

As specified in Doc. 8126 (ENR 3 – ATS Routes), a description of the special procedures required in a route or part of a route must be included where applicable.

Under these circumstances, permanent or non-permanent routes should be listed together, inasmuch as a route can contain permanent and non-permanent segments. Special procedures for each route or segment, however, should be published in a specific part of the AIP.

2.8. Planning Principles

The planning principles for developing an ATS route network were established in the Guide for the Implementation of RNAV Routes in the CAR/SAM Regions, approved through Conclusion 12/7 of the GREPECAS/12 meeting. To facilitate reference to those principles, they will be included in this document.

2.8.1. Airspace planners should keep the following planning principles in mind:

a) Air traffic volume in existing and proposed routes;

b) Establishment of the shortest routes possible for most of the flights;

c) Prioritise the planning of areas of greater air traffic volume;

d) Meet the needs of civil and military users;

e) Integration of the route network and support sectorisation at the start of the planning process;

f) Integrate the route network and the TMA arrival and departure flight paths (SIDs and STARs).

2.8.2. **Air traffic volume in existing and proposed routes**

Considering the advantages of RNAV routes and the growing number of users trained in RNAV flight, implementation of an RNAV route normally absorbs most of the air traffic of one or more "conventional" routes. Therefore, the elimination of any of the existing "conventional" routes should be evaluated and accomplished, if necessary, through an analysis of the air traffic volume in each of the routes involved, whether they are RNAV routes or not. It is important to stress that maintaining "conventional" routes for a small number of users not equipped for RNAV flights does not necessarily mean increasing airspace complexity, for that complexity is due to the number of existing flights for each route and not to the additional crossings that would appear on the aeronautical charts.

2.8.3. **Establishment of the shortest routes possible for most of the flights**

Considering the need to serve most users at their optimum flight profiles, the establishment of direct routes as close as possible to the origin/destination paths should be prioritised. Inasmuch as the RNAV route normally absorbs most of the air traffic, implementation of the RNAV route will most likely take preference over the "conventional" route. It is important to emphasise that it may be necessary to maintain routes for users whose aircraft are not RNAV-equipped. Inasmuch as it is not always possible to establish a route between origin and destination, the need should be considered for implementing specific one-way routes for departure from and arrival at a TMA, using specific arrival and departure control sectors. Airspace planning should consider the requirement for establishing new airspace sectorisation when beginning the implementation of a new version of the route network.

2.8.4. **Prioritise the planning of areas of greater air traffic volume**

In order to accomplish the aim of giving most users the shortest routes possible, airspace planning should start in airspace regions with the greatest air traffic volume and proceed to those with the least volume, giving priority to flows with the highest air traffic volume.

2.8.5. **Integration of the RNAV route network and support sectorisation at the start of the planning process**

Adequate airspace sectorisation needs to be guaranteed from the very beginning of the planning process. Furthermore, the planning should not consider FIR boundaries, in order to create a seamless airspace, including, if necessary, the delegation of air traffic services.

2.8.6 **Integration of the route network and TMA arrival and departure paths**

Integration of the RNAV route network and TMA arrival and departure paths should be considered during the initial planning phase for implementation of a new route network, considering the need to reduce pilot and air traffic controller workloads, mainly through more effective use of flight management systems (FMS) and by reducing the ground/air/ground communications load.

2.9. Concepts facilitating route network implementation

Some concepts facilitate consistent and harmonised implementation of a route network.

These concepts are:

a) PBN – as already mentioned in item 2.2

b) FUA – as already mentioned in item 2.5

c) Seamless Airspace – Route network planning and implementation should be accomplished with the application of the seamless concept, without considering FIR boundaries. ATS delegation should be applied as needed to increase ATM capacity and efficiency. This delegation should normally occur:

- When the crossing points are located near the FIR or sector boundaries, to give the controller the necessary information sufficiently in advance to be able to manage the traffic entering the adjacent FIR.
- When the flying time in a given FIR is short, in order to reduce coordination among ATC units responsible for adjacent FIRS, thereby reducing the workload.
- In TMA sectors, to allow the controller to anticipate the regulation/radar vectors for the incoming flow.

d) RVSM – RVSM has permitted the application of additional flight levels that favour the conditions required for distributing aircraft into Flight Level Assignment Systems (FLAS), in order to improve flight safety, thereby minimising the effect on the efficiency of air operations.

2.10 Planning Techniques

2.10.1. Establishment of specialised routes

In high traffic density areas, additional ATC capacity may be obtained by segregating arrival and departure routes and separating them from overflight routes. This increase in capacity is due to the fact that this structure normally avoids conflicts among ascending and descending aircraft and between these and overflying aircraft. As a result, this structure should be applied for the arrival and departure phases. Application of Continuous Descent Approaches (CDAs) depends upon the establishment of specialised arrival paths, through either one-way routes or STARs, with the least possible number of crossings, to allow aircraft to descend without interruption.

2.10.2. Establishment of specialised sectors

Based upon the structure described in item 2.10.1, specialised sectors may be established by grouping routes of a similar nature, like arrival sectors, departure sectors or overflight sectors. These sectors are applied especially in ACC sectors responsible for "feeding" a highly complex TMA, as well as in TMAs themselves.

2.10.3. Crossings as close as possible to the origin of the flights

The route network must be developed in such a way that the essential route crossings used by the main traffic flows are as close as possible to their origin. Considering the complexity of the area of origin, however, it may be appropriate to transfer the crossings to areas with lower traffic/route densities. Crossings should also be executed preferably in areas with ATS surveillance.

3. Analysis and Diagnosis of the SAM ATS Route Network

3.1. General Considerations

The purpose of this chapter is to make a general analysis and diagnosis of the SAM ATS route network, in light of the planning criteria presented in chapter 2. The items in this chapter correspond to the items in chapter 2, in order to facilitate an understanding of the criteria applied in the analysis and diagnosis of the SAM ATS route network.

Based on material available at the ICAO South American Office, it can be noted that information was already available in 1957 about the development of a route network for the SAM Region and the South Atlantic. It can also be noted in reports of the First and Second CAR/SAM Air Navigation Meetings, held in 1976 and 1989, respectively, that the stability of the route network was always a matter of concern and that there were a prevalence of isolated State initiatives for the development of their own route networks. There were initiatives in the Region for the development of an integrated route network, with the holding of panel meetings starting in 1980, but with limited results, considering the complexity of the subject and the limited time available for the studies. It was only in 1999, during the Third CAR/SAM Air Navigation Meeting (CAR/SAM/3 RAN - Buenos Aires, Argentina, 5-15 October 1999) that the ATS route network was considered stable and fit to be a part of the Regional Air Navigation Plan.

Generally speaking, the development of the route network in the SAM Region was always based on the specific requirements of isolated routes; there was no global analysis that considered broader operational requirements, and in which a functional interrelationship among the various elements of airspace structure were sought, such as: ATS Routes, Control Sectors, Control Areas, TMAs, etc.

As already mentioned, the work performed by the States with the support of Regional Project RLA/98/ resulted in the implementation of 77 RNAV routes, the modification of the paths of 58 routes, and the elimination of only 7 routes. Although this effort has met the operational requirements of airspace users, the addition of RNAV routes to the existing airspace structure ended up, in some cases, by increasing airspace complexity and thus reducing ATC capacity.

3.2. Use of Performance-Based Navigation

RNAV-5 application in the South American Region, foreseen for November 2010, will create the necessary conditions for harmonising aircraft and operator approval criteria for flights in RNAV routes and will provide the necessary elements for establishing adequate spacing between routes.

According to conclusion SAM/IG/2- 3, the assessment of fleet navigation capacity will make it possible to analyse the feasibility of implementing an exclusive RNAV-5 airspace in the SAM Region in a given volume of airspace (for example, between FL 290 and FL 410). This exclusionary airspace would constitute an important element for reducing airspace complexity, with the corresponding increase in airspace capacity.

Another important aspect to be considered is that the maintenance of conventional routes in the SAM Region should take into account the coverage of available radio aids, so that they can be effectively flown by aircraft not equipped for RNAV operations.

3.3. Regional and Domestic Routes

The SAM route network has always been planned and implemented on an isolated basis. International routes are normally analysed in an international forum like the RNAV/RNP Task Force, the ATM/CNS Subgroup, AP/ATM meetings, etc., individually, without any specific concern for an integrated analysis based on the need to assess the impact on ATC capacity. States are responsible for domestic routes, which are implemented without any specific integration into the regional route network. In light of the interrelationship between domestic and regional routes, planning and implementation should be integrated, with a view towards obtaining an optimum structure of the airspace, including ATC control sectors.

SAM ATS routes should be implemented using a top-down strategy, in order to identify the main regional air traffic flows, as well as the shortcomings in the route network and in the sectorisation of the ATC units involved. Based on that identification, it would be possible to conceive an integrated regional/national network that would meet the needs of airspace users and ATS providers. That network should consider the need for sectorisation, integration of the airports it does not serve, the use of non-permanent routes, and connectivity among TMAs.

3.4. Relationship between ATS Routes and Control Areas (CTAs)

According to the information contained in the CAR/SAM Regional Air Navigation Plan (Doc. 8733), six States in the SAM Region have adopted widespread use of CTAs in their airspace above and beyond the ATS routes. Nonetheless, in a significant portion, air traffic control service is not provided to flights that are occasionally made outside the ATS routes. As a result, ATS routes must be established to serve IFR flights, even though the air traffic flow may not be significant, in order to guarantee that they receive air traffic control service.

More widespread adoption of CTAs in the SAM Region could avoid the need for implementing ATS routes in significantly less dense air traffic flows.

3.5. Flexible Use of Airspace (FUA)

In the SAM Region, there is no systematic and harmonised application of a Flexible Use of Airspace, unlike EUROCONTROL. There is a close relationship between FUA application and ATFM, inasmuch as the adoption of non-permanent routes can increase airspace capacity in a given portion of the airspace.

The expansion and systematic application of FUA in the SAM Region is a key element for optimising the route network, in view of its importance for ensuring, at least partially, that aircraft fly their optimum profiles and, in some cases, that airspace complexity is reduced.

Note the need for full development of documentation concerning FUA application, including standards and procedures, as well as the harmonised publication of special procedures applied to non-permanent routes, as provided for in Doc 8126.

3.6. Protected Airspace – Route Spacing Concept

The protected airspace and RNAV route spacing concept envisaged in Annex 11 was not defined in the SAM Region. As a result, spacing between RNAV routes, one of the key elements of airspace planning, has not yet been established, leaving controllers to apply vertical and/or horizontal separation based on ATS Surveillance.

One of the most important factors in optimising the route network would be to establish minimum spacing between RNAV routes, based on the specific characteristics of the SAM Region, such as air traffic volume, air traffic concentration, passing frequency, operational errors, available ATS surveillance, aeronautical communications, and ATC intervention capacity, etc.

Airspace complexity is intrinsically related to the need for controller intervention to provide aircraft separation. The more “natural” the separation between aircraft, ensured by appropriate spacing between ATS routes, the less the need for controller intervention and, consequently, the greater the available ATC capacity.

3.7. **Harmonised route network publication**

As already mentioned in item 3.5, there is a need to harmonise the way special procedures established for non-permanent routes are published, as required by Doc. 8126. That harmonisation will enable aircraft operators to find out about the operating restrictions on the use of those routes, particularly if they can be used for flight planning and when they can be used for that purpose. Likewise, the restrictions could also establish specific fuel requirements in the event that more appropriate routes were not available.

3.8. **Planning Principles**

The planning principles should be applied in order to make an objective analysis based on statistical data and the experience of State experts, in order to remedy shortcomings in the route network and in the sectorisation of the ATC units involved.

Collection and analysis of flight data in a significant time sample is key to planning route optimisation, considering that it will be possible through that data to determine the main air traffic flows and, as a result, to prioritise the implementation of routes designed to serve those flows, thereby establishing the most direct routes possible for most flights. Collection of that data has always been limited, thus preventing an in-depth analysis of the main air traffic flows.

Data collection by CARSAMMA, which is limited to the airspace between FL 290 and FL 410 (sample used in RVSM safety assessment), is normally applied, allowing for a preliminary analysis, considering that data are not available for all SAM States. The data obtained from CARSAMMA, processed and analysed in the PBN Implementation Programme for En route Operations, approved by Conclusion SAM/IG/2-1, were inserted in the table. A preliminary analysis of that data reveals that in most of the SAM FIRs, considering the States for which data are available, a small number of ATS routes (up to 14) are used by a large number of flights (85% or more). Table 2, for its part, shows that a small number of city-pairs (up to 16) accounts for most of the air traffic movement (51% or more) in the FIRs.

Air traffic movement between FL 290 and FL 410, by FIR, and percentage of flights on the main ATS Routes Period: 13 to 28 January 2008				
Country	**FIR**	**Amount of air traffic in the sample**	**Percentage of flights on the main ATS routes**	**Number of ATS Routes**
Argentina	Cordoba	1769	92%	13
	Comodoro Rivadavia	713	96%	9
Bolivia	La Paz	684	97%	13
Brazil	Amazonica	4085	67%	13
	Brasilia	11333	50%	12
	Curitiba	10499	44%	13
	Recife	3418	66%	13
	Sao Paulo (TMA)*	1911	100%	4
Chile	Antofagasta	1480	89%	10
	Pascua	164	100%	4
	Puerto Montt	412	94%	6
	Punta Arenas**	281	98%	7
	Santiago	2109	89%	13
Guyana	Georgetown	187	97%	9
Panama	Panama	1389	70%	14
Paraguay	Asuncion	605	90%	14
Peru	Lima	3599	69%	14
Suriname	Paramaribo	369	98%	11
Uruguay	Montevideo***	892	100%	12

* Provides ACC service in the segment between Rio de Janeiro and Sao Paulo. This sample does not cover a significant volume of flights because the aircraft fly below FL 290.
** 91% on ATS UT 100 route
*** A significant volume of flights does not appear in the sample because the aircraft fly below FL 290.

Table 1 – Air Traffic Movement between FL 290 and FL 410, by FIR, and percentage of flights on the main ATS Routes

Air traffic movement between FL 290 and FL 410, by FIR, and percentage in the main city-pairs Period: 13 to 28 January 2008				
Country	**FIR**	**Amount of air traffic in the sample**	**Percentage of flights of the sample in the main city-pairs**	**Number of city-pairs**
Argentina	Cordoba	1769	51%	14
	Comodoro Rivadavia	713	65%	13
Bolivia	La Paz	684	60%	14
Brazil	Amazonica	4085	27%	14
	Brasilia	11333	28%	17
	Curitiba	10499	28%	16
	Recife	3418	31%	16
	Sao Paulo (TMA)*	1911	76%	15
Chile	Antofagasta	1480	70%	15
	Pascua	164	89%	11
	Puerto Montt	412	94%	10
	Punta Arenas**	281	92%	8
	Santiago	2109	58%	13
Guyana	Georgetown	187	79%	10
Panama	Panama	1389	48%	15
Paraguay	Asuncion	605	53%	13
Peru	Lima	3599	39%	16
Suriname	Paramaribo	369	71%	15
Uruguay	Montevideo**	892	75%	11

* Provides ACC Service in the segment between Rio de Janeiro and Sao Paulo. A significant volume of flights is not covered in the sample because the aircraft fly below FL 290.

** A significant volume of flights is not covered in the sample because the aircarft fly below FL 290

Table 2 – Air Traffic Movement between FL 290 and FL 410, by FIR, and percentage in the main city-pairs

Another important planning phase is the consideration, at the beginning of the work, of airspace sectorisation under ATS unit jurisdiction, inasmuch as the route network has a decisive influence on the sectors and, *vice versa*, the latter can influence the composition of the route network. Route network and ATC planning are not integrated in the SAM Region. In the more complex airspaces, airspace modeling and ATC simulation (in real and/or fast time) tools need to be applied to assess the interrelationship between the route network and airspace sectorisation.

Another analysis that is needed is the integration of the route network and TMA arrival/departure paths (SIDs and STARs), considering that RNAV promotes conditions for the establishment of specific arrival/departure sectors, thereby reducing airspace complexity. It can be noted that most SAM States have not yet implemented the necessary SIDs and STARs to link up departure/arrival paths with the route network. It is important to consider those procedures during the route network planning phase.

3.9. **Concepts that facilitate implementation of the Route Network**

Of the concepts mentioned in item 2.9, the CAR/SAM Regions have already implemented RVSM in January 2005. RNAV-5 implementation, foreseen for November 2010, will contribute enormously to the optimisation of the SAM route network. As already mentioned in item 3.5, there is a need to systematise FUA application in the Region, as a means for optimising use of the available airspace. In addition, the planning of airspace in general and of the new route network in particular, should consider the seamless concept in order to achieve a better airspace structure. As a result, the conception of a new SAM route network should not consider FIR and sector boundaries for its development.

3.10. **Planning Techniques**

From the available information, it is not possible to identify whether the planning techniques mentioned in item 2.10 are being applied. Nevertheless, the use of one-way routes can be noted in the following TMAs, indicating the possibility that specialised arrival and departure routes and sectors are being used:

a) Argentina: Ezeiza

b) Brazil: Belo Horizonte, Brasilia, Rio de Janeiro, and Sao Paulo.

c) Chile: Santiago

d) Uruguay: Montevideo.

In optimising the route network, it would be important to assess the specific operational requirements of the main TMAs, in order to identify the need for specialised arrival and departure sectors. Should the TMAs need such, it would be necessary to establish points of entry and departure, in order to allow for the development and integration of the route network into the structure of the main TMAs of the SAM Region. It would also be necessary to evaluate whether that integration would be accomplished by means of the route network or through SIDs/STARs linking the main airports to trunk routes that would serve the main regional flows.

4. Implementation Phases

The SAM route network should be optimised in phases, in order to achieve the corresponding operational benefits as early as possible. The concept of route network versions would be incorporated starting in phase 2, considering that the airspace structure is changing in keeping with the growth in air traffic movement, the shift in air traffic demand from one Region or airport to another, and the available technology, among other aspects. The use of route network versions reflects the need for their periodic comprehensive revision, in order to always guarantee the best possible airspace structure. The implementation phases, with their corresponding activities, are set forth in the Programme for Optimising the ATS Route Network of the South American Region that is presented as Attachment A to this programme. This chapter describes the activities listed in Attachment A.

4.1. Phase 1 – RNAV-5 Implementation

It is advisable to consider RNAV-5 implementation as the beginning of the route network optimisation programme, keeping in mind that it is a concept that will facilitate that optimisation. That implementation phase will be carried out in keeping with the SAM PBN Implementation Programme, approved by the SAM/IG/2 meeting and which is based on the PBN Roadmap approved by GREPECAS.

4.2. Phase 2 – Implementation of Version 1 of the SAM ATS Route Network

The second phase would correspond to the first version of the SAM ATS route network, within a new integrated development concept. This new version should consist of a broader analysis of the route network, based on statistical data about air traffic movement and fleet navigation capacity, seeking the elimination of unused routes and the exclusion or reduced use of "conventional" routes in a volume of airspace yet to be determined, in which a significant majority of users are equipped for RNAV-5 operations. That phase is directly related to phase 1 and a significant portion of the part relating to the Airspace Concept, envisaged in the RNAV-5 Implementation Programme in the SAM Region, would be detailed during said phase of the Route Network Optimisation Programme. It would be desirable for phases 1 and 2 to be implemented at the same time. Inasmuch as that may not be possible, given the complexity of the route network studies, this programme will maintain two separate phases.

4.2.1. Draft the Feasibility Study for Optimising the SAM Route Network

This activity aimed at assessing the feasibility of optimising the route network, the strategy to be used, and the proposal of a detailed action plan to accomplish said optimisation, is part of the study carried out.

4.2.2. Airspace Concept

The development of the Airspace Concept is the basis for optimising the route network, inasmuch as that concept is fundamental for instituting measurable benefits for airspace users. In that connection, the necessary analyses for the development of that concept should be based on statistical data about air traffic movement and the capacity of the aircraft fleet operating in the SAM Region.

4.2.2.1. Collect traffic data in order to understand airspace traffic flows

Statistical data are essential for shaping an airspace structure that conforms to the airspace planning principles and techniques presented in items 2.8 and 2.10 of this programme, respectively. Traffic data should be collected periodically in order to analyse the evolution of air traffic demand in the Region. According to the discussions held by the SAM/IG meetings, the SAM States should use the form presented in Attachment B, to collect the necessary data for developing version 1 of the SAM route network. It is essential for States to fill in the form according to the instructions given, in order to ensure that the data are consistent and effectively used in the analysis, as well as to facilitate their processing.

4.2.2.2. Analyse the Fleet Navigation Capacity

The Fleet Navigation Capacity is necessary to determine the airspace volume in which it is possible to apply RNAV on an exclusionary basis, in order to optimise aircraft flow and, at the same time, reduce the complexity and the pilot and air traffic controller workload. This task corresponds to task 1.3 of the SAM RNAV-5 Implementation Programme and should be completed in 2009.

4.2.2.3. Determine the gateways of the main TMAs in the SAM Region

States should present their National PBN Implementation Plans, as foreseen in Resolution 36/23 of the 36th ICAO Assembly and in Conclusion 15/38 of GREPECAS/15. States should develop their own airspace concepts for PBN planning and implementation in the TMAs. This will lead them to define the gateways for the main TMAs in the SAM Region. In version 1 of the route network, it will only be possible to have TMA gateways for the States that have already undertaken their PBN implementation process or any other way to restructure airspace in the TMAs. Furthermore, the information available from the States in developing version 1 should also be considered in this phase.

4.2.2.4. Determine and obtain the necessary tools for conducting the study mentioned in item 4.2.2.5 (aeronautical charts, specific software)

The detailed study specified in item 2.2.5 of the Action Plan for Phase 2 calls for specific tools, like aeronautical charts and specific software, to permit an adequate analysis of the SAM route network. Such tools will also be necessary for the workshop envisaged in item 2.2.6 of the same action plan. In this way, Regional Project RLA/06/901, with the support of the SAM/IG/3 meeting, shall determine these tools and seek the means to obtain them. Generally speaking, it will be necessary to have aeronautical charts containing the route network, the main TMAs, the SIDs and STARs and the approach procedures of the main airports in the SAM Region. It would also be advisable to use flight planning software like, for example, FliteStar (Jeppesen), containing the information mentioned in the aeronautical charts, in order to facilitate information management. Furthermore, it would be advisable to use software that would allow for the design of new routes, with the automatic determination of approximate geographic coordinates of significant points.

4.2.2.5. Conduct a detailed study of the SAM ATS route network, with a view to preparing version 1 of the route network

Considering the complexity of the task of developing a new version of the route network for the SAM Region, it will be necessary for a group of experts to be assigned to prepare a preliminary version containing all of the relevant information, permitting experts of each SAM State to evaluate it, for purposes of reviewing and validating the study. The main aim of version 1 of the SAM route network will be to minimise airspace complexity through the elimination of ATS routes not being used, and the elimination of "conventional" routes in an appropriate volume of airspace. The study should also seek to integrate regional and domestic routes, including proposals for the elimination and/or realignment of domestic routes, to be considered by the States involved. It is important to stress that the determination of the interface points between the CAR and SAM Regions will be of key importance for guaranteeing the interoperability of the route networks of the two Regions. It will also be possible in that phase to obtain operational advantages from realigning ATS routes to serve TMA gateways of States that already possess that information.

The study should develop a proposed preliminary amendment to the CAR/SAM Air Navigation Plan. It will also be necessary for the study to establish the required safety assessment methodology, in accordance with the magnitude of the proposed changes and of the need to determine the spacing between RNAV-5 routes in the SAM Region. The SAM/IG/5 Meeting should review the complete study in order to seek a version in keeping with the planning of the States involved.

4.2.2.6. Hold a workshop of SAM experts to review and validate the study referred to in item 4.2.2.5.

The SAM States should review and validate the work described in item 4.2.2.5, including proposals for the elimination and/or realignment of domestic routes. The most rapid and effective way of performing that review and validation would be through a workshop where the responsible experts could present the work done, in the necessary detail for an appropriate evaluation. The State experts could use the same tools used for the study, thereby facilitating its understanding. It is expected that the experts participating in the workshop will have the authority to decide on the implementation of the route network, using the same model applied in the AP/ATM meetings.

4.2.3. Implementation of Version 1 of the SAM ATS Route Network

The SAM Regional Office and the States are responsible for the activities of this item, in terms of processing the proposed amendment to the CAR/SAM Air Navigation Plan and publishing version 1 of the SAM ATS Route Network, respectively. The dates for the implementation activities will be established in keeping with the complexity of the amendments proposed to the study mentioned in 4.2.2.5 and decided in the workshop mentioned in 4.2.2.6.

4.3. Phase 3 – Implementation of Version 2 of the SAM ATS Route Network

The third phase would correspond to version 2 of the SAM ATS route network and should consist of the complete restructuring of the route network in a search for complete integration between ATS routes, control sectors, TMAs, etc., applying the Flexible Use of Airspace concept. This phase would require specific airspace modeling and ATC fast-time simulation tools.

4.3.1. Flexible Use of Airspace

As already mentioned in items 2.9 and 3.5, Flexible Use of Airspace is one of the concepts that facilitates optimisation of the route network and that is not being systematically applied in the SAM Region. Inasmuch as the various implementation projects existing in the Region would not permit this subject to be addressed in version 1 of the SAM route network, an FUA application model would be established for version 2 of the route network.

4.3.1.1. Develop Guidance Material for Application of the Flexible Use of Airspace Concept

FUA application depends upon the development of appropriate guidance material, from which States may obtain, in a harmonised way, all of the procedures applicable at regional level. An example of FUA application is that carried out by EUROCONTROL, which can be obtained from the EUROCONTROL Handbook for Airspace Management (ASM.ET1.ST08.54000.HBK02-00), at its website address: http://www.eurocontrol.int/airspace/gallery/content/public/documents/fua/EUROCONTROL%20ASM%20HBK%20Ed2-A05%20-%20Released%20Issue%20140308.pdf. Other EUROCONTROL guidance documents can be obtained at the following web address: http://www.eurocontrol.int/airspace/public/site_preferences/display_library_list_public.html. This initial guidance material should be limited to basic FUA application, considering the lack of specific tools for airspace management (ASM) in real time. In general terms, that application would be based on the use of routes similar to those used by EUROCONTROL as CDR 1 and CDR 3. The CDR 2s depend upon the cited ASM tools that shall not be available for version 2 of the route network.

The guidance material should include, *inter alia*, the following aspects:

- Model for the use of non-permanent routes, similar to that applied by EUROCONTROL (Conditional Routes – CDR).
- Criteria for defining scenarios in which non-permanent routes are applied.
- Criteria for categorising non-permanent routes.
- Harmonised publication of non-permanent routes.
- Representation of non-permanent routes in aeronautical charts.

4.3.1.2. Establish a Civil-Military Coordination Committee to evaluate application of the Flexible Use of Airspace Concept

To ensure FUA application, each State should create a Civil/Military Coordination Committee to evaluate the opportunities for using the Special Use Airspaces (SUA). It is important to stress that the success of this initiative will depend on the power of the committee to guarantee airspace use to all users, according to their specific needs, while avoiding, inasmuch as possible, the permanent reservation of airspace that would lead to the waste of airspace whenever it is not being used.

4.3.1.3. Develop proposals for route implementation and/or realignment, in keeping with the use of FUA

Based on the flexible use of airspace achieved through the Civil-Military Coordination Committee, State airspace planners should develop route implementation or realignment proposals that would have a significant impact on the development of version 2 of the route network, bearing in mind opportunities for offering users better flight profiles and a possible reduction in airspace complexity.

4.3.2. Airspace Concept

The general methodology used for version 1 and described in item 4.2.2. should be used to develop the airspace concept for version 2 of the route network. The items below will describe only the particular elements to be applied in the development of version 2.

4.3.2.1. Collect traffic data to understand airspace traffic flows

It is important to stress that States should develop a methodology for routine data collection to permit appropriate airspace planning and also the verification of an increase and/or shift in air traffic demand that would require a change in the existing airspace structure.

4.3.2.2. Analyse Fleet Navigation Capacity

In the same way mentioned in item 4.3.2.1 for data collection, States are expected to implement a permanent fleet navigation capacity analysis system to assess the extent of the airspace volume where RNAV-5 would be applied on an exclusionary basis, and to enable the evolution foreseen in the PBN Roadmap for the medium term (RNP-2).

4.3.2.3. Determine the gateways of the main TMAs in the SAM Region

The gateways of the main TMAs in the SAM Region may evolve in accordance with systematic application of FUA and progress in PBN implementation in TMAs and approaches.

4.3.2.4. Determine and obtain the necessary tools for conducting the study mentioned in item 4.3.3.5 (aeronautical charts, specific software)

Continuous evaluation of the tools available for developing the route network is necessary, in order to obtain the most appropriate material to ensure an effective and efficiency work.

4.3.2.5. Make a detailed study of the SAM ATS route network, with a view to developing version 2 of the route network

The development of version 2 of the route network will require a more in-depth analysis, considering that. in addition to the route network itself, the study should also include other aspects, like control sectors, TMA interface, etc. In this sense, and in view of the complexity of version 2, the main objective of the study is to propose scenarios that can be evaluated through the use of airspace modelling and fast-time simulation tools. Such scenarios would be the various options for version 2 of the route network, which would require objective data in order to select the best implementation option, considering the metrics defined in the study, such as fuel consumption, CO^2 emissions, the number of aircraft crossings, etc.

4.3.2.6. Conduct studies of Airspace Modeling and Fast-Time Simulation

Based on the study carried out in 4.3.2.5, Airspace Modeling and Fast-Time Simulation studies should be conducted in order to obtain the necessary data for the analysis to be made by State experts, permitting a decision to be taken regarding the option to be implemented.

4.3.2.7. Hold a workshop among experts from SAM States

Based on the studies mentioned in items 4.3.2.5 and 4.3.2.6, State experts shall review and validate the option of version 2 of the route network to be implemented.

The study should develop a preliminary proposal of amendment to the CAR/SAM Air Navigation Plan. It will still be necessary for the study to establish the required safety assessment methodology, in keeping with extent of the proposed changes and the need to determine RNAV-5 route spacing in the SAM Region. The SAM/IG/9 should review the complete study in order to seek a version that is in line with the planning of the States involved.

4.3.2.8. Implementation of Version 2 of the SAM ATS Route Network

The SAM Regional Office and the States are responsible for the activities under this item, in terms of processing the proposed amendment to the CAR/SAM Air Navigation Plan and publishing version 2 of the SAM ATS Route Network, respectively. The dates for the implementation activities will be established in accordance with the complexity of the modifications proposed in the studies mentioned in 4.3.2.5 and 4.3.2.6 and determined in the workshop mentioned in item 4.3.2.7.

ATTACHMENT 1 (REVISED 8 JULY 2011)

PROGRAMME FOR OPTIMISING THE ATS ROUTE NETWORK IN THE SOUTH AMERICAN REGION
(GPIs 1, 5, 7, 8, 10, 11)

Activity	Start	End	Responsible party	Observations
1. **Phase One – RNAV-5 Implementation**				
1.1. RNAV-5 implementation in the SAM Region	**Apr 2008**	**Oct 2011**	**Regional Project RLA/06/901**	The implementation will be carried out according to the Implementation Programme approved at the SAM/IG/2 meeting. The implementation of RNAV 5 was postponed to 22 September 2011
2. **Phase Two – Implementation of Version 1 of the SAM ATS Route Network**				
Activity	**Start**	**End**	**Responsible party**	**Observations**
2.1. Conduct a Feasibility Study for Optimising the SAM Route Network	March 2009	Apr 2009	Regional Project RLA/06/901	
2.2. Airspace Concept				
2.2.1 Collect traffic data to understand air traffic flows	June 2008	SAM/IG/4	SAM/PBN/IG (Project RLA/06/901) States	Task 1.2 of the RNAV-5 Implementation Project The Secretariat shall send request to States for data collection using the form contained in Appendix C to the Report on Agenda Item 2, in Excel format.

2.2.2	Analyse the fleet navigation capacity	June 2008	SAM/IG/4	SAM/PBN/IG (Projects RLA/06/901 and RLA/99/901) States IATA	Task 1.3 of the RNAV-5 Implementation Project
2.2.3	Determine the gateways of the main TMAs in the SAM Region	SAM/IG/3	SAM/IG/4	States	
2.2.4	Determine and obtain the necessary tools to make the study mentioned in item 2.2.5 (aeronautical charts, specific software)	SAM/IG/3	SAM/IG/4	SAM/PBN/IG (Project RLA/06/901)	Flight Star.(Verify if the acquisition of another software is necessary)
2.2.5	Make a detailed study of the SAM ATS route network, with a view to preparing version 1 of the route network, including the following: • Indicate the domestic and international ATS routes that should be eliminated, in accordance with their use; • Propose the volume of exclusionary airspace for RNAV-5 application • Indicate the "conventional" RNAV routes that should be eliminated or replaced by RNAV routes in the exclusionary RNAV-5 airspace. • Indicate the RNAV routes that should be realigned, in accordance with the gateways of the main SAM TMAs (see 2.2.3). • Describe in detail the proposed new SAM route network, based on the analysis of the aforementioned items. • Describe in detail the interface between the SAM route network and the CAR route network. • Propose the initial draft Proposal of Amendment to the CAR/SAM ANP	SAM/IG/4	March 2010	SAM/PBN/IG (Project RLA/06/901)	Three persons for a period of 3 weeks. IATA and operators would be invited to select one person to assist in the development of this task.

2.2.6 Prepare safety assessment required, applying a qualitative methodology through the use of SMS	April 2010	May 2010	Project RLA/06/901	One person two weeks
2.2.7 Hold the Workshop of Experts from the SAM States to review and validate the study made under item 2.2.5.	SAM/IG/5	June 2010	SAM/PBN/IG (Project RLA/06/901) States	Further to SAM/IG/5
2.3 Implementation of Version 1 of the SAM ATS Route Network				
2.3.1 Process the proposal of amendment to the CAR/SAM Air Navigation Plan	TBD		SAM Regional Office	Shall depend on the decisions to be adopted by the routes workshop of 2.2.6
2.3.2 Publish version 1 of the SAM ATS Route Network	TBD		States	Shall depend on the decisions adopted in the routes workshop of 2.2.6.
2.3.3 Entry into effect of version 1 of the SAM ATS Route Network	TBD			
3. **Phase Three – Implementation of Version 2 of the SAM ATS Route Network**				
Activity	**Start**	**End**	**Responsible party**	**Observations**
3.1. **Flexible Use of Airspace**				

3.1.1. Develop guidance material for the application of the Flexible Use of Airspace concept, including: • Model for using non-permanent routes similar to that applied in EUROCONTROL (Conditional Routes – CDR). • Criterion for defining scenarios in which non-permanent routes are applied • Criterion for categorising non-permanent routes • Harmonised publication of non-permanent routes • Representation of non-permanent routes in aeronautical charts	SAM/IG/7	SAM/IG/9	SAM/PBN/IG (Project RLA/06/901)	Request for support of Regional Project RLA/06/901 to hire an expert for a two-week period.
3.1.2. Establish the Civil-Military Coordination Committee to evaluate application of the Flexible Use of Airspace concept mentioned in 3.1.1.	SAM/IG/7	SAM/IG/9	States	The Civil/Military Committees should be implemented in those States which have not done so. Civil/Military Meeting/Workshop to be carried out in Lima from 16 to 19 August 2011.
3.1.3. Develop proposals for route implementation and/or realignment, in keeping with the utilisation of FUA	SAM/IG/7	SAM/IG/9	States	See 3.1.2
3.2. **Airspace Concept**				
3.2.1. Collect traffic data to understand air traffic flows	SAM/IG/7	Sept. 2011	SAM/PBN/IG (Project RLA/06/901) States	Secretariat will send request to States. Reply date September 2011.
3.2.2. Analyse the fleet navigation capacity	SAM/IG/7	SAM/IG/9	SAM/PBN/IG (Projects RLA/06/901 and RLA/99/901) States IATA	Completed. The information on RNAV5 approval is being sent to CARSAMMA and air operators and aircraft are

				expected to be ready for the implementation date (October 2011). The navigation capacity data base will be completed as provided in SAM/IG/2 and SAM/IG/4 (Conclusion SAM/IG/4-3).
3.2.3. Determine the gateways of the main TMAs in the SAM Region	SAM/IG/7	SAM/IG/9	States	
3.2.4. Make a detailed study of the SAM ATS route network with a view to developing version 2 of the route network, including: • Determine necessary tools for the holding of the study mentioned in item 3.2.5 (Aeronautical Charts, specific software). • Definition of scenarios for the SAM airspace structure, including ATS routes, control sectors, TMA interface, for assessment using airspace modelling and fast-time ATC simulation tools. • Indicate the ATS routes that should be eliminated in accordance with their utilisation; • Propose, if necessary, the extent of exclusionary airspace volume for RNAV-5 application • Indicate, as necessary, the "conventional" ATS routes that should be eliminated or replaced by RNAV routes in accordance with the possible extension of the exclusive RNAV-5 airspace volume. • Indicate the RNAV routes that should be realigned in keeping with possible	SAM/IG/7	Nov 2011	SAM/PBN/IG (Project RLA/06/901)	Hiring of an expert is programmed for a two-week period during 2011.

modifications to the gateways of the main TMAs in the SAM Region. • Detail possible scenarios for version 2 of the SAM route network and of control sectors, based on the analysis of the previous items • Detail the interface between the SAM route network and the CAR route network • Propose the initial draft Proposal of Amendment to the CAR/SAM ANP. • Define the required safety assessment (qualitative or quantitative). • With the air traffic data, consider the possibility to implement RNAV5 parallel routes with adequate separation.				
3.2.5. Carry out a Seminar/Workshop on Airspace Planning	ATSRO/3	March 2012	Regional Project RLA/06/901	Request support of Regional Project RLA/06/901 and DECEA (Brazil). The objective is to prepare airspace planning from States of the Region.
3.2.6. Carry out the Fourth ATS Routes Network Optimisation Workshop/Meeting for the SAM Region (SAM ATSRO/04)	ATSRO/3	April 2012	Regional Project RLA/06/901	
3.2.7. Make Airspace Modelling and Fast-Time Simulation studies to assess the scenarios developed in 3.2.5	August 2012	SAM/IG/10	Regional Project RLA/06/901	Ask on the use of the tool available in Brazil. If its use is feasible, procure, through Regional Project RLA/06/901, the participation of two Experts from States of the Region.
3.2.8. Hold the Fifth Workshop/Meeting for the ATS routes network optimisation of the SAM Region (SAM ATSRO/05), s to review and	SAM/IG/10	March 2013	Project RLA/06/901 States	

	validate the studies made in items 3.2.4, and 3.2.7				
3.2.9.	Carry out the Third Workshop/Seminar on risk analysis of Version 02 of the ATS routes network for the SAM Region	March 2013	SAM/IG/11	Regional Project RLA/06/901	
3.3.	**Implementation of Version 2 of the SAM ATS Route Network**				
3.3.1.	Process the proposal of amendment to the CAR/SAM Air Navigation Plan	August 2013		SAM Regional Office	
3.3.2.	Publish version 1 of the SAM ATS Route Network	22 August 2013		States	
3.3.3.	Entry into effect of version 2 of the SAM ATS Route Network	17 October 2013			

Agenda Item 2: Analysis of Version 1 of the SAM ATS routes network

2.1 The regular programme of the ICAO South American Region, amongst other implementation projects, has focused its attention on the optimisation of the ATS route network. The first two meetings of the SAM Implementation Group (SAM/IG/1 and SAM/IG/2) analysed the current condition of the route network. These meetings identified various problems that prevented the attainment of the level of effectiveness sought through the optimisation. However, the actions being taken by SAM States and IATA are mitigating or eliminating such problems, as applicable.

2.2 In this regard, the Meeting took note that the purpose of this programme was to further improve airspace structure in order to achieve an inter-functional air traffic management system that is available to all users during all flight phases, that meets the agreed safety levels, provides cost-effective operations, is environmentally sustainable, and meets national security requirements.

2.3 Upon analysing Version 2 of the ATS route network corresponding to Phase 3 of the optimisation programme, the Meeting recognised that there were several tasks that would permit a harmonised implementation in the Region. Accordingly, the Meeting analysed various aspects related to the processes leading to the implementation of this version, as described below.

Collection of traffic data to understand airspace traffic flows

2.4 The Meeting deemed it necessary to make a new collection of statistical data for analysing the evolution of air traffic demand in the upper airspace starting at FL245 in the Region with a view to the implementation of Version 2 of the SAM ATS route network.

2.5 In this respect, the Meeting noted that SAM States would have to use the form and the corresponding instructions for the collection of the data required for the development of Version 2 of the SAM route network. Likewise, it is essential for SAM States to complete the form in accordance with the instructions to ensure data is effectively used for analysis and to facilitate its processing.

2.6 It was noted that data collection shall include all flights conducted in the upper airspace (FL245 or above) of the SAM Region, on domestic and international routes, during the period 1 to 31 August 2011, and the data sent to the SAM Regional Office before 30 September 2011.

2.7 In this regard, the Meeting considered that the collection of the requested data was vital for analysing the flows in the Region in order to conduct a detailed and in-depth feasibility study of such flows. Based on the above, the Meeting decided to formulate the following conclusion:

Conclusion ATSRO/03/02 Collection of traffic data in the upper airspace

That SAM States collect data on all flights in the upper airspace of their respective FIRs during the period 1-31 August 2011, and send it to the SAM Regional Office before 30 September 2011, using the form shown in **Appendix A** to this part of the report.

Requirements for requesting the implementation of a new RNAV route

2.8 The Meeting recalled that during the ATS route network optimisation process, it had been noted that, in many cases, the routes requested by airspace users were ultimately not used as expected, creating setbacks and unnecessary expenditure for civil aviation administrations.

2.9 Likewise, the Meeting recalled that, in addition to the aspects listed under Agenda Item 1 (paragraph 1.6), the conclusions and criteria derived from the first analysis of the ATS route network of the Region were still valid and should be taken into account in the new process:

a) The development of a harmonised and consistent route network requires States to participate actively in international working groups for the establishment or revision of the regional route network.

b) The main regional air traffic flows, as well as those extending beyond the Region and that have a direct impact on the regional route network must be identified in order to determine the deficiencies in the route network and in ATC sector organisation.

c) Establish and review the ATS route network and the supporting sectorisation in order to accommodate the main air traffic flows, reducing the complexity of the airspace structure and balancing ATC workload.

d) Integrate the routes required for the connection of the regional route network to/from airports that are not served by such network. Likewise, there is a need to integrate the non-permanent routes required to alleviate air traffic load in the main ATS routes, and to ensure optimum flight profiles.

e) Ensure connectivity between the ATS route network and TMA airspace.

f) Establish a phased implementation to ensure consistency with implementation by the States.

2.10 The Meeting noted that airspace planners should take into account the main planning principles:

a) Air traffic volume in existing and proposed routes;

b) Establishment of as short as possible paths for most flights;

c) Prioritise planning of areas with greater air traffic volume;

d) Navigation specifications

e) Meet the needs of civil and military users;

f) Integrate the route network and the supporting sectorisation from the beginning of the planning process;

g) Integrate the route network and TMA arrival and departure (SID and STAR) paths.

h) Make sure that at least 30 monthly flights are conducted on the requested route. This criterion should be also applied when considering the elimination of existing routes.

i) Avoid isolated implementation of RNAV routes unless absolutely necessary.

2.11 In turn, to facilitate the study, users shall submit the following information:

a) The point of origin and the point of destination of the proposed RNAV route.

b) Direction of the route proposed

c) Airspace affected

d) Number of yearly operations foreseen.

e) Distance in NM between the point of origin and the point of destination in the existing routes.

f) Reduction of miles with respect to existing routes and total number of NM between the point of origin and the point of destination.

g) Annual operational

h) fuel savings, in Kg, according to the types of aircraft to be operated in the route (average, if appropriate).

i) Annual reduction of CO^2 emissions into the atmosphere in the new route.

j) Preliminary geographical coordinates of significant points on FIR boundaries and of the point where the route crosses an existing one.

k) List of FIRs involved in the proposed RNAV route.

l) Comments/remarks.

Note: If possible, a graph depicting the approximate route path shall be presented.

2.12 **Appendix B** shows a format containing the information to be submitted when requesting the implementation, realignment, elimination of RNAV routes, which was adopted by the Meeting.

2.13 Likewise, the Meeting concluded that it would be advisable for the information contained in Item 1 (paragraph 1.6) and the aforementioned information to be consolidated in planning criteria for use by the States and airspace users in this implementation process.

Identification of gateways of the main TMAs in the South American Region

2.14 The Meeting took note that, in order to develop an optimum structure with a routes network duly integrated to airport arrival and departure operations, it is necessary that ATS route planners and terminal area planners design together and harmoniously the new structures, to avoid airspace restrictions that prevent an orderly, flexible and safe flow to and from airports, and guarantee a continuous and seamless airspace as envisaged in the ICAO global air navigation plan and the ATM operational concept.

2.15 Another aspect to be taken into account is that when speaking of terminal area ***design***, the tendency is to associate it to the design or construction of approach procedures as established in the PANS/OPS, when the latter actually supplements the design of the terminal area, which has a broader meaning, and refers to the design of the terminal airspace concept, with its routes, holding patterns, airspace structure and sectors, all integrated into the ATS route network.

2.16 As established in the ATS route network optimisation programme, the initial planning phase for the implementation of a new route network must consider the integration of the RNAV route network and TMA arrival and departure paths, taking into account the need to reduce pilot and air traffic controller workload, mainly through a more effective use of flight management systems (FMS) and reduced ground/air/ground communications.

2.17 One of the main factors for the implementation of Phase 3 of the optimisation programmes, defined in item 3.2.3, is that States shall define the gateways of the main TMAs of the SAM Region. This task is to be completed between the SAM/IG/7 meeting (May 2011) and the SAM/IG/9 meeting, which is scheduled for May 2012.

2.18 The Meeting recognised that the challenges that airspace planners will face when designing the airspace, in addition to the expected growth of air traffic, will be:

a) meet ATS requirement of ensuring that capacity is maintained at least at current levels and that delays due to terminal airspace restrictions are minimised;

b) meet safety requirements;

c) Satisfacer los requerimientos para asegurar la protección del medio ambiente;

d) meet the various demands and requirements of airspace users, taking into account the new and diverse development plans of users.

2.19 Accordingly, planners should avoid the tendency to create an area of airspace that is "independent" from the route network and, when designing their TMAs, in conjunction with PANS/OPS procedure designers, they should consider ATC operational requirements, with due consideration to environmental protection and the associated costs and benefits.

2.20 Furthermore, it was deemed advisable for adjacent States to hold bilateral work meetings in order to harmonise airspaces involving bordering areas or sectors, mainly in routes that may be affected by traffic flow between adjacent FIRs and/or TMAs, and develop operational agreements which shall be published in their respective AIPs.

2.21 In order to determine the gateways of the main TMAs of the SAM Region, States will probably have to conduct a more extensive analysis and maybe also restructure such airspaces, in which case it might be necessary to take into account some principles for the development of a fully integrated airspace.

2.22 It should be noted that the Meeting was apprised of the work being done by Brazil for redesigning its main TMAs. The presentation made was well taken and the Meeting acknowledged the delegation of Brazil for such presentation, and requested that it be posted on the Regional Office website so that it may serve as reference material. It also requested the Secretariat to study the possibility of scheduling, preferably in the first quarter of 2012, a course on airspace planning with the support of Regional Project RLA/06/901.

2.23 Based on the above, the Meeting formulated the following conclusion:

Conclusion ATSRO/03/03 Identification of gateways of the main TMAs

That SAM States that have not done so yet:

a) start the implementation of tasks related to item 3.2.3 of the action plan of Phase 3 of the ATS route network optimisation programme, which requires the definition of gateways for the main TMAs for their inclusion in Version 2 of the ATS route network;

b) require their airspace planners, when conducting their activities, to take into account, amongst other aspects, the planning principles listed in **Appendix C** to this part of the report; and

c) report to the SAM/IG/8 meeting on the progress made, and to the SAM/IG/9 meeting on the work completed.

Flexible use of airspace

2.24 Under this agenda item, the Meeting recognised that the flexible use of airspace is an airspace management concept described by the International Civil Aviation Organization (ICAO) that addresses the optimisation, balance and equity in the use of airspace by the different civil and military users, facilitated by strategic coordination and dynamic interaction. It is based on the Resolutions of the 35th ICAO Assembly, initiative GPI-1 of the Global Air Navigation Plan (ICAO Doc 9750), and GREPECAS.

2.25 Likewise, the Meeting noted that there were activities that required that a certain volume of airspace be reserved for their exclusive or special use (SUA) during certain periods of time, given the characteristics of their flight profile, the importance or risks involved in the operations to be conducted in such airspace, and the need to keep them effectively and safely separated from other types of aeronautical activities.

2.26 Likewise, the Meeting went further into the analysis of the flexible use of airspace (FUA) concept, as an airspace management concept based on the principle of accommodating airspace users inasmuch as possible, taking into account effective communications and the cooperation and coordination required to ensure security, safety, efficiency and environmental sustainability. It also recognised the importance of flexible use of airspace management.

2.27 In addition, it was noted that some SAR activities, military exercises or actions may require joint coordination and cooperation with more than one State at a given moment, in which case the establishment of civil/military coordination and cooperation committees in each State is of greater relevance.

2.28 Several States recognised that, traditionally, civil/military cooperation and coordination in the South American Region has been based on a dialogue between civil and military authorities aimed at achieving a better use of airspace for both parties and improving cooperation for the use and integration, where possible, of their respective air traffic control facilities.

2.29 It was also noted that ICAO requests States to inform military authorities about ICAO provisions in force, such as Article 3 of the Convention on International Civil Aviation, ICAO Assembly Resolution A37-15, Appendix O, and Annex 11, Sections 2.16 and 2.17) and guidelines [*Manual concerning safety measures relating to military activities potentially hazardous to civil aircraft operations* (Doc 9554) and *Manual concerning interception of civil aircraft* (Doc 9433)] related to civil/military coordination. It also requests States to promote familiarisation visits of military staff to air traffic services units (ATS).

2.30 The Meeting agreed that although the standards, recommended practices, recommendations and conclusions of various events that have been approved for regional application are aimed at mutual cooperation between civil and military authorities, not all States have a formal civil/military cooperation and coordination committee.

2.31 The participants of the Meeting stated that these committees or cooperation and coordination bodies permit the connection of the parties, at all levels, with the purpose of agreeing on decisions concerning civil and military airspace management and air traffic control issues, which are essential for the implementation of Version 2 of the ATS route network, since they rely directly on the agreements reached between the parties for the application of the flexible use of airspace.

2.32 Accordingly, the Meeting deemed it advisable to approve the following conclusion:

Conclusion ATSRO/03/04 Establishment of a civil/military cooperation and coordination committee

That SAM States that have not done so yet:

a) take the corresponding action to implement the civil/military cooperation and coordination committee or other relevant body, in which both civil aviation as well as military representatives would participate, together with other airspace users; and

b) use the flexible use of airspace management guides shown in **Appendix D** to this part of the report as guidance material.

2.33 Likewise, the Meeting, with respect to this matter, felt that the drafting of a model letter of agreement between civil and military units for managing the flexible use of airspace would be of great assistance for the States of the Region, and thus requested the Secretariat to analyse the most appropriate mechanisms for developing this model.

Identification of special use areas and airspaces in the South American Region

2.34 The Meeting agreed that, in order to attain an integrated ATS route network that responds to the interests of all users, including commercial, military, general, and sport aviation and unmanned aircraft systems, it was necessary to establish a civil/military cooperation system that would permit an analysis of all restricted, prohibited and danger areas implemented in the South American Region, with a view to implementing the flexible use of airspace concept.

2.35 The Meeting also recognised that the analysis is not intended to arbitrarily eliminate or reduce the assigned special use airspaces, but rather to implement the collaborative decision-making concept, which entails the identification of the best options to satisfy all airspace users, and to make sure that the stated needs are met, regardless of airspace restrictions.

2.36 The Meeting also recalled that Chapter 4 of the PBIP, upon examining ATM system gaps in the SAM Region, identifies as one of the main deficiencies the lack of a policy and procedures for the flexible use of airspace, which hinders airspace design and management, preventing the application of an optimum airspace structure and the use of optimum flight paths (see PBIP, 4.3.1 c).

2.37 The Meeting noted that, although substantial improvement in the implementation of the flexible use of airspace has been made in recent years, the limitations of the current ATM system persist in some sectors, leading to tactical-level operations in most cases.

2.38 The Meeting recommends that States analyse the various situations in which the safety of operations requires the establishment of procedures or letters of agreements to avoid tactical management of airspace, since the latter would entail real-time decisions by the control service. Although tactical management must be included in every action plan, it should be used as a last resort, since it is not possible to apply the best solution when time is scarce and the data to be considered is diverse.

2.39 The Meeting identified the existence of permanently reserved airspaces, mainly for military purposes, which somehow hindered appropriate airspace planning, not permitting direct flights between airports of origin and destination and/or city pairs, as well as operations at inappropriate flight levels and/or speeds that prevent aircraft from maintaining optimum flight profiles, a factor of significance in ground and/or en-route system-related delays.

2.40 The Meeting agreed that SAM States should establish policies concerning the use of temporarily- or permanently-reserved airspaces in order to avoid, inasmuch as possible, the adoption of airspace restrictions, and also consider and integrate unmanned aircraft systems (UAS) in their air navigation system, which adds a new component to the aeronautical system that should be taken into account.

2.41 During the Meeting, and as an example of civil/military coordination and cooperation, Argentina informed about its experience in the coordination with its military units to facilitate and enable the implementation of RNAV route UT650, whose path was affected by the upper vertical limit (UNL) of restricted areas SAR101 (Río Seco de las Peñas) and SAR55 (upper north Reynolds), established at FL285 to enable the implementation of the route starting at FL 290, with no restrictions. In this regard, the Meeting felt that it was absolutely necessary for this type of coordination and cooperation to be institutionalised through the establishment of a civil/military coordination and cooperation committee in those States that had not implemented such committee yet, as previously stated.

2.42 In view of the above, the participants of the Meeting recognised that the implementation of the flexible use of airspace should start with an assessment of dangerous, restricted and prohibited airspaces that affect or could affect routes with greater air traffic flow.

2.43 The Meeting took note of the prohibited, restricted and danger areas that States have published in their AIPs. In order to begin a preliminary study that will permit a more detailed and qualitative analysis of these special use areas, the States requested the Secretariat to propose of form to continue obtaining data from the States.

2.44 A simple analysis of the information provided reveals that there is a high percentage of special use airspace that should be analysed within the context of civil/military cooperation in each State of the Region. There are 124 prohibited areas, 421 restricted areas, 41 danger areas and 83 special areas published in the Region, including the volcanic areas identified by Chile, and special areas for air sports and recreational activities identified by Panama. This information will be processed subsequently in order to define the percentage of special use airspace existing in the SAM Region, and how these areas could affect civil aviation operations in the Region. More information may be submitted to the SAM/IG/8 meeting for analysis.

2.45 In the understanding that the implementation of the flexible use of airspace concept could hinder airspace optimisation, ICAO deemed it advisable to conduct a seminar/workshop on civil/military cooperation, to be held on 16-19 August 2011, and to encourage the participation of the States of the Region. This event is part of a global campaign of regional civil/military cooperation events recommended by the Global Air Traffic Management Forum on Civil/Military Cooperation (Montreal, October 2009), and endorsed by the 37th ICAO Assembly (October 2010), which formulated Resolution A37-15, Appendix 0: Coordination and Cooperation between Civil and Military Air Traffic. The seminar/workshop will consist of two days of seminar and two days of workshop with a view to presenting participants with Circular AN/330 *Civil/Military Cooperation in Air Traffic Management*; improving civil/military cooperation and coordination, sharing information between civil/military authorities, and analyzing the impact of modernisation efforts by States.

2.46 It is expected that the event will help to establish good communication between the parties involved, in order to improve civil/military cooperation, coordination and joint operation. Given the importance of the presence of both civil and military experts, it is expected that invitation to this seminar/workshop will be extended by the respective civil aviation administrations to the military authorities involved in the coordinated management of the flexible use of airspace.

2.47 In view of the above, the Meeting agreed that a survey on the use and management of the restricted, prohibited and danger areas of the Region should be conducted in order to update the information, analyse the impact of such areas on the airspace, and consider their modification, elimination or change of category.

Conclusion ATSRO/03/05 Analysis on the use and management of restricted, prohibited, danger and special use areas

That:

a) the Secretariat send to the States the form shown in **Appendix E** to this part of the report with a view to updating the information on the use and management of restricted, prohibited and danger areas in the SAM Region;

b) States start assessing dangerous, restricted and prohibited airspaces that affect or could affect traffic flow, so that this information may be processed and subsequently submitted to the SAMI/IG/8 meeting and end in the SAM/IG/9 Meeting; and

c) States identify possible users of segregated airspace volumes with whom it would be necessary to sign letters of operational agreement (*e.g.*: UAS, OPS MIL, recreational activities, anti-hail activities, etc.).

Route optimisation

2.48 The Meeting, when analysing the routes pending implementation recalled that the SAM ATSRO workshop/meetings, taking into account the extent of the work to be carried out with regard to the ATS route network, had deemed it advisable for SAM States and IATA to make a thorough analysis of the results of the work carried out at those workshops.

2.49 Likewise, it agreed to also use SAM/IG meetings to analyse the ATS route network, making maximum use of all available instances.

2.50 The analysis conducted based on available statistical data identified some routes/city pairs that deserved a more in-depth analysis, taking into account the significant movement of air traffic involved. Those city pairs were included in Chapter 9 of Version 1 of the SAM route network and States concerned were requested to begin the corresponding studies in the FIRs under their jurisdiction.

2.51 The Meeting identified the domestic routes proposed in Argentinian territory and deemed it advisable to await the response of the various users, as proposed in the requirement of ANAC of Argentina.

2.52 Likewise, the following regional routes were analysed:

- **Realignment of UN857 between EZE/MELO (unidirectional up to MELO)**
- **Realignment of UN741 between BAGE/KUKEN (unidirectional up to KUKEN**
- **Change of direction of UM654 between FLZ/KUKEN (unidirectional up to KUKEN)**

2.53 When analysing the aforementioned route optimisation proposals, the Meeting decided that the respective study be conducted jointly by the administrations of Argentina and Uruguay.

Realignment of UL550: EZE/LIM - ROS/LOA - (bidirectional)

2.54 This route is pending analysis by the users concerned, and coordination of flexible use of airspace because of the restricted areas in Chile.

Realignment of RNAV UM424 between ALBAL/ASADA and the creation of an RNAV route between NEBEG/ASADA/EZE

2.55 Regarding this realignment of RNAV UM424 and a new RNAV route, it was decided to begin the corresponding studies.

Proposal for route ECA-USU

2.56 Regarding the proposal to create a new RNAV route between ECA/EGOSA and between ECA/USU, the administration of Chile will make the necessary consultations concerning the impact that the path of this new RNAV route would have on the restricted areas in the NAS TMA.

Realignment of UL650 between LAR/ATA and extension to the point ELASA (bidirectional)

2.57 This realignment was analysed by the Meeting, and a response to this new proposal is expected from the various users.

Elimination of UT650 between ESITO/CBA and realignment of UM400 between ALBAL/ARULA (bidirectional), eliminating the segment between CBA/ARULA

2.58 The Meeting made an initial analysis of this proposal, and the delegate of Argentina stated that studies with the various users involved would continue and the results presented to the SAM/IG/8 meeting.

Proposal of a route SPIM - SBGR

2.59 Following an analysis by the representatives of IATA, Ecuador and Peru, the Meeting decided not to include it in Version 2 of the SAM ATS route network because of turbulent conditions in the mountain range.

Elimination of route ATS UA556/UW64 and implementation of a new RNAV route between Asunción (SGAS) and Ezeiza (SAEZ)

2.60 In this regard, the delegates of Paraguay expressed that the elimination of route UA556/ UW64 was based on operational considerations since it did not have the ideal separation from the new route UM 402 already implemented.

2.61 In this respect, the Meeting noted that the restriction on early implementation of routes outside of the action plan for the implementation of ATS routes did not apply to those cases in which the elimination, realignment and/or implementation of routes was based on safety considerations, and both administrations (Argentina y Paraguay) agreed to hold a bilateral meeting to further the study and analysis of this proposal, and address other pending matters.

Route SBPA – SPIM – SBPA

2.62 Regarding this route, the Meeting took note that the administrations concerned would conduct the corresponding feasibility analyses.

Optimisation of the route Lima (SPIM) - Sao Paulo (SBGR)

2.63 This route was proposed by the representative of IATA – LAN, which required the implementation of a new direct RNAV route between ETEBA, OBLIR and the VIR VOR. Since this route affected the Lima and La Paz FIRs, the two administrations (Peru and Bolivia) undertook to study this proposal in order to facilitate a more direct route between Lima and Sao Paulo.

Review of contingency plans

2.64 The Meeting took note of the importance of a systematic review of the contingency plans agreed between the States, in light of the modifications made or to be made to the regional ATS route network.

APPENDIX A

FORM FOR COLLECTING AIR TRAFFIC MOVEMENT DATA

1 – FIR IDENTIFICATION:

2- DATE	3 CALL SIGN	4 TYPE OF AIRCRAFT	5 AD ORIGIN	6 AD DESTINATION	7 TIME OF ENTRY TO FIR	8 LEVEL	9 ATS ROUTE 1	10 ROUTE CHANGE FIX	11 ATS ROUTE 2	12 TIME OF EXIT FROM FIR	13 REMARKS

GUIDANCE FOR COMPLETING THE DATA COLLECTION FORM

1. Introduction

- This form is to be used for collecting data for obtaining an air traffic movement sample for planning the optimisation of the SAM ATS route network in the upper airspace of the SAM Region (FL 245= UNL)

- The form must be completed in **EXCEL** format so that all events (*i.e.*, traffic movements) occurred during each day of the period requested are introduced in chronological order **in a single file** (**without blank lines or spaces or intermediate titles**).

- Data will correspond to daily air traffic movement of all IFR flights in the established airspace volume during the period requested, by FIR, and in all FIR routes or route segments, as well as IFR flights conducted outside of ATS routes.

2. Completion of Excel template fields

- Field 1 " FIR IDENTIFICATION"
  Insert the ICAO designator contained in Doc 7910.
  Example: **SBBS, SUMU, SAEU**.

- Field 2 "DATE"
  Insert only **numeric characters** as follows: **dd/mm/yy**
  Example: For 1 September 2009, insert **01/09/09**.

- Field 3 "CALL SIGN"
  Insert a maximum of **7 alphanumeric characters, with no spaces or hyphens**.
  Examples: **AAL906, PTLCN, VRG8764**.

- Field 4 “TYPE OF AIRCRAFT"
  Insert the ICAO designator contained in **Doc 8643.**
  Examples: for Airbus A320-211, insert **A320**; for Boeing B747-438, insert **B744**.

- Field 5 “AD ORIGIN” (aerodrome of origin)
  Insert the ICAO designator contained in **Doc 7910.**
  Examples: **SBGR, SCEL, SAEZ**.

- Field 6 “AD DESTINATION” (aerodrome of destination)
  Insert the ICAO designator contained in **Doc 7910.**
  Examples: **SBSP, SULS, SAEZ**.

- Field 7 “TIME OF ENTRY TO FIR”
  Insert numeric characters as follows: hh:mm.
  Examples: for 1 hour and 9 minutes, insert 01:09; for 12 hours and 23 minutes, insert 12:23.

- Field 8 “LEVEL” (flight level at the point of entry to the FIR)
  Insert **3 numeric characters** that correspond to the flight level during the first flight segment.
  Example: for FL 290, insert 290.

- Field 9 “ATS ROUTE 1” (first ATS route at the point of entry to the FIR)
  Insert a maximum of **5 alphanumeric characters, with no spaces or hyphens**.
  Examples: **UA301, UB689**

- Field 10 “ROUTE CHANGE FIX” (fix at which the aircraft leaves ATS route 1 to enter ATS route 2)
  Insert a maximum of 5 alphanumeric characters related to the fix where the route was changed.
  Examples: POKON, KUBEK, BAQ.

- Field 11 “ATS ROUTE 2” (ATS route following the change at the fix specified in Field 10)
  Insert a maximum of **5 alphanumeric characters, with no spaces or hyphens**.
  Examples: **UA301, UB689**

  Note: If the ATS route changes more than once, complete as many Fields 10 and 11 as necessary.

- Field 12 “TIME OF EXIT FROM FIR”
  Insert numeric characters as follows: hh:mm.
  Examples: for 1 hour and 9 minutes, insert 01:09; for 12 hours and 23 minutes, insert 12:23.

- Field 13 “REMARKS”
  Insert important information related to a particular flight.

APPENDIX B

TABLE WITH DATA ON NEW RNAV ROUTES

Example:

Origin/ Destination	Direction	Airspace	Navigation Specifications	Number of yearly operations	Current distance between origin and destination or route segment (NM)	Reduction in the proposed route (NM)	Operational savings of fuel/year (Kg)	Annual reduction of CO_2 emissions in the new route	List of FIRs involved	Geographical coordinates of significant points	Remarks
1	2	3	4	5	6	7	8	9	10	11	12
Lima / Brasilia	Bidirectional	Upper and lower	RNAV5	1	1784	70 NM (1714)	292.054	922890.64	Lima La Paz Amazónica Brasilia	(P1) 13 27 52.89S / 069 57 13.56W (P2) 14 41 47.61S / 060 15 38.52W (P3) 14 55 17.19S / 058 21 53.41W	Direct route LIM/BRS States involved: Peru, Bolivia and Brazil

Explanation of the table:

1. The points of origin and destination of the proposed RNAV route will be included.
2. Direction of the proposed route: bidirectional or unidirectional. For unidirectional route, indicate direction.
3. Proposed airspace: upper, lower, or both.
4. Fill with Navigation Specifications.
5. Number of yearly operations foreseen.
6. Distance in NM between the point of origin and the point of destination or route segment in the existing routes.
7. Reduction in miles with respect to existing routes, and total number of NM between the points of origin and destination.
8. Annual fuel savings, in kilogrammes, according to the types of aircraft to be operated in the route (average, if appropriate).
9. Annual reduction of CO2 emissions into the atmosphere in the new route
10. List of FIRs involved in the proposed RNAV route.
11. Geographical coordinates of significant points on FIR boundaries and where the route crosses an existing one.
12. Comments/remarks.

Note: A graph of the approximate path of the route will be submitted.

APPENDIX C

TMA AND APPROACH PLANNING PRINCIPLES

a) The process should consider the systematic application of FUA and the progress made in PBN implementation in TMAs and approaches.

b) Safety must be enhanced, or at least maintained at current levels, in compliance with ICAO SARPs on the subject, and based on the corresponding risk analysis.

c) The design must repond to operational requirements, balancing the interests of the ATC, airspace users, and the environment, promoting the flexible use of airspace.

d) Airspace must be designed applying the collaborative decision-making concept (see the SAM CDM Manual); thus, TMA redesign must involve a multidisciplinary team of experts and representatives of all the stakeholders.

e) Terminal airspace should be designed as an integral part of airspace from both the lateral and vertical point of view in order to ensure a continuous flow of operations.

f) Use continuous descent techniques to maximise operational efficiency in face of the requirements and restrictions in the airspace concerned, establishing optimised arrivals to the extent possible (Doc 9931).

APPENDIX D

FLEXIBLE USE OF AIRSPACE MANAGEMENT GUIDELINES

1.1 The flexible use of airspace (FUA) is an airspace management concept based on the principle of accommodating, to the extent possible, all the users of this airspace, taking into account effective communications and the cooperation and coordination required to ensure security, safety, efficiency and environmental sustainability.

1.2 The concept includes airspace management functions—strategic, pre-tactical and tactical—which are independent from each other but closely related, and that must be performed in a coordinated manner in order to ensure an efficient use of airspace.

1.3 When different aeronautical activities with different needs share the same airspace, their coordination should be aimed at the safe conduction of flights and the optimum use of available airspace.

1.4 The systematic application of this concept must be taken into account for the optimisation of the route network, especially for the definition of scenarios where non-permanent or conditional routes will be implemented.

1.5 Furthermore, some SAR activities, military exercises or activities may require joint coordination and cooperation with more than one State at a given moment, in which case the establishment of civil/military coordination and cooperation committees in each State becomes more relevant.

Information management

1.6 Good information management is critical for the successful application of the FUA concept. Consequently, the timely distribution and accuracy of the information to be transmitted to civil and military controllers regarding airspace status and specific air traffic conditions having a direct impact on the safety, efficacy and efficiency of operations become of critical importance.

1.7 In this regard, timely access to updated information on airspace status is vital for all parties that wish to use available airspace structures, for purposes of preparing or modifying their flight plans.

Civil/military coordination and cooperation

1.8 The effective and harmonised application of the flexible use of airspace concept in a given airspace volume requires precise and dynamic civil/military coordination standards that take into account the needs of all users and the nature of their various activities, trying to avoid permanent reservation of airspace inasmuch as possible and optimising its flexible use.

1.9 In order to establish a civil/military coordination and cooperation committee for managing the flexible use of airspace concept, it is absolutely necessary to have clear terms of reference and apply basic ruling principles that are consistent with the flexible use of airspace concept.

Terms of reference of the civil/military cooperation and coordination committee

1.10 Some terms of reference that should be taken into account are proposed below:

a) Achieve civil/military coordination and an optimum level of joint use of airspace, providing the highest level of safety, regularity and efficiency for international civil air traffic;

b) Establish national policies related to the flexible use of airspace (FUA);

c) Analyse and establish the necessary links between the relevant civil ATS units and military air defence units to ensure, on a daily basis, the integration or segregation of civil and military air traffic operating in the same portions of airspace;

d) Review the existing ICAO provisions related to civil/military cooperation and coordination;

e) Analyse the special use of airspace in order to validate actual use and establish agreements for joint use of airspace;

f) Establish the procedures required for joint and flexible use of airspace;

g) Develop and establish safety measures related to military activities that are potentially hazardous for civil aircraft operations;

h) Draft and sign letters of operational agreement between civil and military ATS units for managing traffic in the airspace concerned;

i) If prohibited, restricted and danger areas need to be maintained, make sure that they are in compliance with Annexes 2 and 15, and that the following principles are applied:

1) take due account of the need not to compromise the safe and cost-efficient operation of civil aircraft;
2) provide intermediate areas within the designated area that are appropriate for the activities to be carried out, according to time and size;
3) use ICAO standard terminology for defining the areas;

j) Analyse and determine, at regular intervals, whether it is still necessary to maintain prohibited, restricted or danger areas;

k) Make the appropriate arrangements and develop procedures for the establishment of temporary reservations of airspace;

l) Other aspects that civil and military authorities may deem appropriate to analyse within the context of the civil/military cooperation and coordination committee or body they deem more convenient.

Basic ruling principles for civil/military coordination and cooperation

1.11 The flexible use of airspace concept should take into account the following ruling principles:

a) coordination and cooperation between civil and military authorities will be organised at a strategic, pre-tactical and tactical management level through the establishment of letters of operational agreement and/or special procedures concerning a given activity, aimed at enhancing safety and airspace capacity and improving the efficacy and flexibility of air operations;

b) consistency between airspace management, air traffic flow management, and air traffic services functions shall be achieved and maintained in order to ensure efficient planning, distribution, and use by all users at the three airspace management levels (strategic, pre-tactical and tactical);

c) reservation of airspace for exclusive or specific use by certain user categories shall be temporary, to be applied only during limited periods of time, based on actual use, and will end when the activity that gave origin to it has ceased. The procedures established in ICAO documents and Annexes shall be followed, as well as those prescribed in letters of operational agreement and/or special procedures;

d) air traffic services units and users shall make the best possible use of available airspace; and

e) coordination and collaborative decision-making among ATS, ATFM and flexible use of airspace management units must be consistent and ongoing during the strategic, pre-tactical and tactical phases of airspace management.

Letters of operational agreement

1.12 In order to accomplish the above, the efficacy of civil/military coordination procedures must be based on standards and procedures that permit an efficient use of airspace for all users, as reflected in letters of operational agreement between military authorities and air traffic services (ATS), and on some basic ruling principles.

1.13 The agreements and procedures aimed at a flexible use of airspace may be contained in letters of operational agreement, which should specify, *inter alia*, the following:

a) the horizontal and vertical boundaries of the airspace concerned;

b) the classification of the airspace available for use by civil air traffic;

c) the units or authorities responsible for airspace transfer;

d) the conditions for airspace transfer to the ATC unit concerned;

e) the conditions for airspace transfer from the ATC unit concerned;

f) airspace availability periods;

g) any limitations to the use of the airspace concerned; and

h) any other relevant procedures or information.

Strategic airspace management

1.14 To ensure a strategic management of airspace, civil and military units providing air traffic services should perform at least the following functions:

a) ensure the application of the flexible use of airspace concept at the strategic, pre-tactical and tactical levels;

b) review user needs regularly;

c) analyse and validate the activities that require airspace reservation or restrictions;

d) define temporary segregated airspace (TSA) structures and procedures that offer multiple reservation and route options;

e) establish criteria and procedures for the creation and use of adjustable lateral and vertical airspace boundaries that will accommodate flight path variations and short-term flight changes;

f) assess domestic airspace structures and the route network in order to plan flexible airspace structures and procedures;

g) determine the specific conditions under which the responsibility for separation between civil and military flights will fall upon civil and military air traffic services units or military control units;

h) establish and provide users with airspace structures in close cooperation and coordination with neighbouring member States when the corresponding airspace structures have a major impact on cross-border traffic or on flight information region boundaries, with a view to ensuring optimum use of airspace by all users;

i) establish consultation mechanisms between individuals or bodies and all parties and organisations involved in order to properly meet user needs;

j) develop, assess and review operational procedures, coordination and results related to the flexible use of airspace periodically;

k) establish mechanisms for storing data concerning airspace requests, assignment and actual use for subsequent analysis and planning of activities;

l) ensure that areas destined for training and recreation, ATC sectors, route networks, and arrival and departure procedures are implemented and published in the appropriate time and manner, in keeping with the requirements of all airspace users and taking into account ICAO strategic objectives.

Pre-tactical airspace management

1.15 Civil and military units should ensure the introduction of the appropriate and preferably automated support systems that will enable those responsible for airspace assignment operations to provide timely information about airspace availability to all affected users, special airspace management units, if any, air traffic service providers, and all parties and entities concerned.

1.16 The relevant military control units and air traffic services units must exchange information about any changes in airspace activation plans in a timely and efficient manner, and make sure that all affected users are informed about effective airspace status.

Tactical airspace management

1.17 Safety requires the establishment of coordination and cooperation procedures between civil and military air traffic services units to enable direct and real-time exchange of relevant information between civil and military controllers providing services in the same or in adjacent airspace volumes, for the resolution of concrete traffic situations. It is important to make the information available to civil and military controllers and military control units, especially when so required for safety reasons, through fast exchange of flight data, including the position and flight intentions of aircraft.

Safety assessment

1.18 It is important, within the safety management process and before introducing any changes to the implementation of the flexible use of airspace, that a safety assessment be conducted that includes hazard identification and risk analysis and mitigation in accordance with SMS procedures.

Lessons learnt

1.19 Following the operational phase, it is deemed advisable to make an assessment of problems encountered. The results of inspections, audits and SMS analyses can provide important information that must be used for continuous airspace optimisation. Accordingly, the reports of joint actions related to the flexible use of airspace as well as the analysis by a specialised, multidisciplinary group acquire major significance in the analysis of lessons learnt, with a view to improving the procedures and regulations for the optimisation of safety and the flexible use of airspace.

APPENDIX E (FUA)

FORM ON THE USE AND MANAGEMENT OF RESTRICTED, PROHIBITED AND DANGER AREAS AND FLEXIBLE USE AIRSPACES OF THE SAM REGION

State: _____

FIR: _____

Date: _____

Type of special use area or airspace (1)	Size (2)		Period of use (3)	Nature of the activity (4)	Managed by (5)	Does it affect current operations? (6)	Does it affect ANSP planning? (7)	Remarks (8)
	Lateral in Km^2	Vertical limit						

Instructions for completing the form:

1. Type of special use area or airspace: Insert the identification of the prohibited, restricted, danger or special use area (recreational, farming, etc.)
2. Size: Insert lateral dimension, in square kilometres, and the vertical dimension with upper and lower limits.
3. Period of use: Insert schedule or period of activation of the area, if applicable
4. Nature of the activity: Insert detailed information about the activity conducted in the area (parachuting, training, etc.)
5. Managed by: Insert the name of the organisation or body responsible for area activation.
6. Does it affect current operations? Insert information about its impact on the current design of the area.
7. Does it affect ANSP planning? Insert information as to whether ANSP planning could be affected by the area.
8. Remarks: Insert additional information that the State considers should be taken into account.

Agenda Item 3: Other matters

3.1 The delegations of Ecuador and Peru held informal meetings to address issues of common interest on occasion of the beginning of air operations at the bordering airport of Santa Rosa in Ecuador, which involves air navigation in city pairs, particularly between Santa Rosa and Piura and which in the future could involve other bordering airports of the two States.

3.2 The core topic was the statement by Ecuador concerning the deactivation of the MACHALA VOR/DME and the realignment of the routes converging in the Santa Rosa VOR/DME, which entails the modification of transfer points at the FIR boundaries, and the possibility of establishing a new TMA in Santa Rosa adjacent to the Piura TMA.

3.3 The delegations of the two States established the need to hold joint work meetings as soon as possible with the purpose of harmonising airspaces and routes, drafting a letter of operational agreement containing the operational procedures between the ATC units of Piura and Santa Rosa, and publishing them in their respective AIPS with a view to optimising navigation and the safety of air operations in the bordering region.

Need to create a contingency plan for cases of occurrence of volcanic ash

3.4 During the Meeting, Argentina described its experience with the events resulting from volcanic activity, with dispersion of ashes, and their impact on the provision of air navigation services. The Meeting also took note of the need to create a contingency plan to address this type of events that affect more than one FIR. Consequently, the Meeting recalled that ICAO, through the Volcanic Ash Warnings Study Group (VAWSG) and, subsequently, the International Airways Volcano Watch Operations Group (IAVWOPSG), was developing operational procedures for broadcasting volcanic ash warnings in order to enhance the efficacy of volcanic activity detection warnings.

3.5 The Meeting took note that in June of this year, the Puyehue/Cordón Caulle volcano 1507-15 (4042S 07220W) recorded activity with dispersion of a considerable amount of ashes in the form of a cloud/plume.

3.6 Likewise, the intensity of volcano activity, combined with the winds, dispersed the ashes, intermittently affecting large portions of Argentina and, to a lesser degree, of Chile.

3.7 The maximum height of the cloud/plume was between FL 400 and FL 120, and extended down to the surface (GND).

3.8 Based on the warnings emanating from the volcanic ash advisory centre (VAAC) of Buenos Aires, information on the phenomenon began to be disseminated through the issuance of ASHTAMs at 6-hour intervals (see examples of ASHTAMs and guiding graphs).

3.9 In view of the above, the Meeting deemed it important to generate recommendations or actions aimed at preparing air navigation services to face similar situations in the future, based on the lessons learnt in Argentina.

3.10 The Meeting identified as one of the tasks performed to mitigate the impact on safety was the regular dissemination, since the beginning of the event, of warnings describing in detail the characteristics of the ash cloud/plume as dispersion forecasts at 6, 12 and 18 hours.

3.11 The Meeting noted that another action taken by ACCs immediately upon receiving the warning was to assess the airspace affected within their area of responsibility and to issue a report with their conclusions to the Ezeiza NOF, which, after collecting all the reports, published the ASHTAM.

3.12 The group noted the importance of establishing a CRISIS COMMITTEE made up by the main authorities of air navigation and airport services, the regulatory body, IATA, the airlines, the mass media, the national meteorological service, Volcano Expert from the States' Mining Secretariat and other stakeholders, to be activated whenever there was a relevant change in conditions. Decisions were made by consensus pursuant to the CDM (collaborative decision-making) concept.

3.13 The Meeting noted that the complexity, extent and varied features of the airspace had led to a certain degree of harmonisation in the assessment and decision-making by ACCs. In the presence of similar scenarios, it might be efficient to establish a unit (like an ATFM unit) or service to centralise these processes, somehow releasing the ACCs from the responsibility of adopting measures that exceed their powers and/or hinder their natural duties.

3.14 The group considered that the absence of alternate routes agreed between adjacent States and suitable for this type of contingency had restricted the possibility of giving more options to operators. Likewise, the Meeting noted that the level of coordination with volcanologist and meteorologists had be be improved in order to expedite the decision-making process.

3.15 The Meeting took note that the activities of Regional Project RLA/06/901 included the development of a contingency plan that considered events involving eruptions and volcanic ash. It was estimated that the initial draft would be available by the end of 2011. For this activity, the work carried out by ICAO and other Regions, as well as the experience from Argentina and other States of the Region. will be taken into account.