INTERNATIONAL CIVIL AVIATION ORGANIZATION SAM/IG/9-WP/03
South American Regional Office - Regional Project RLA/06/901 09/04/12
Assistance for the implementation of a regional ATM system according to the ATM operational concept and the corresponding technological support for CNS
Ninth Workshop/Meeting of the SAM Implementation Group (SAM/IG/9)
(Lima, Peru, 14 to 18 May 2012)

Agenda Item 2: Optimisation of the ATS route structure

SAM ATS Route Network Optimisation Programme – Phase 3, Version 2

(Presented by the Secretariat)

Summary

This working paper provides information about the activities carried out for the implementation of Phase 3, Version 2, as foreseen in the SAM ATS route network optimisation programme. Likewise, it proposes to the Meeting an analysis of the work done, the introduction of modifications as needed, and the relevant adjustments to the action plan associated to Phase 3, Version 2 of the ATS route network.

References:

- Annex 11 to the ICAO Convention
- Global Air Navigation Plan (Doc 9750)
- SAM ATS route network optimisation programme
- ATSRO meeting reports
- SAMIG meeting reports

ICAO strategic objectives:	*A – Safety* *C – Environmental protection*

1 Background

1.1 As indicated in the introduction to the ATS route network optimisation programme, upon request of the States and international organisations, the ICAO regular programme has focused on the optimisation of the ATS route network, amongst other implementation projects.

1.2 Accordingly, under the auspices of Regional Project RLA/06/901, the meetings of the SAM Implementation Group (SAM/IG) are being held, one of the objectives being the optimisation of the SAM ATS route network.

1.3 **Phase 1** of the route optimisation programme was completed on 20 October 2011 with the implementation of RNAV5, and **Phase 2** of the implementation of Version 1 of the SAM ATS route network was completed in March 2011.

1.4 **Phase 3**, which corresponds to the implementation of Version 2 of the SAM ATS route network, involves a complete restructuring of the route network to achieve a full integration of ATS routes, control sectors, TMAs, etc., applying the flexible use of airspace concept. Consequently, it is much more complex and requires much coordination and work at both State and regional level.

2 **Discussion**

2.1 The SAMIG/8 meeting took note of the improvements to the Action Plan proposed by the SAM/ATS/RO/3 meeting for the implementation of Phase 3, Version 2 of the programme, and agreed to support the following task through Regional Project RLA/06/901:

a) Hiring of 2 experts for a period of 3 weeks to develop guidance material for the implementation of the flexible use of airspace concept, and to conduct a detailed study of the SAM ATS route network with a view to drafting Version 2 of the route network,

2.2 The meeting also agreed to urge States that had not completed the processing and delivery of traffic data collected to get a better understanding of airspace traffic flows to complete this task as soon as possible so as not to adversely affect the SAM route optimisation programme (see Conclusion ATSRO/03/02 – Collection of traffic data in the upper airspace).

2.3 Furthermore, the meeting agreed on some concepts and requirements to be applied in the first analysis of the SAM ATS route network for the implementation of Version 2 of ATS routes, and on the requirements for the implementation of new RNAV routes (see Appendix B to the SAM ATSRO/3 meeting report).

2.4 The meeting also discussed airspace planning principles, the information to be provided by users when submitting their request, the importance of identifying the gateways of the main TMAs in the SAM Region, the flexible use of airspace, the identification of special use areas and airspaces, and the systematic review of contingency plans and letters of operational agreement. (These concepts and requirements are shown in Appendix B to Agenda Item 2 of the SAM/IG/8 meeting report).

Activities carried out

2.5 The terms of reference of the two experts involved in the mission cited in paragraph 2.1 a) of this working paper were:

- To conduct a preliminary study of the SAM ATS route network with a view to drafting Version 2 of Phase 3 of the route network (project activity 1.10)

- To develop a guidance document on the flexible use of airspace concept (project activity 1.10).

2.6 Experts were assigned to work from 12 March to 20 April 2012 at the ICAO South American Office in Lima, Peru.

2.7 Consultants Jorge Fernández and Tomás Yentz, the latter hired through Project RLA 06/901, were in charge of executing these two activities with the assistance of the ATM and AIM/ATM/SAR officers of the SAM Regional Office.

2.8 The first objective was achieved by means of an analysis of the existing SAM ATS route network and the airspace optimisation programme for the region. Aircraft movement statistics were reviewed for August 2011, but were not sufficiently comprehensive and precise for the assigned task, reason why traffic movement collected in 2009 on occasion of the implementation of RNAV-5 in the Region were used, applying a 6 % increase for 2010 and a similar figure for 2011. Based on this

information, an assessment was made of the level of occupancy of the existing route network on the main traffic flows, and based on that definition, a proposal was made for consideration by the States, airspace users, and the regional ATM community in general.

2.9 The fact that many States did not provide traffic movement data on time had a negative impact on the precision of the work. Consequently, the calculated increments must be considered as traffic growth estimates and it would be advisable to insist on State compliance and adjustment of data to the precision required.

2.10 The second objective was achieved through an analysis of global application of the flexible use of airspace concept, taking into account Appendix O to Assembly Resolution A 37-15: Consolidated statement of continuing ICAO criteria and associated practices related specifically to air navigation, which specifically addresses civil/military air traffic coordination and cooperation, and the recommendations of the Global air traffic management forum on civil-military cooperation (2009).

2.11 Likewise, the regional manual was developed taking into account Circular 330-AN/189, which contains guidance and examples of good practices in civil-military cooperation. It recognises that the growing civil air traffic and military air missions would significantly benefit from a more flexible use of airspace, and recommends and provides guidance on best practices in civil-military cooperation that might be adopted by the States.

2.12 The result of the work was two documents: one containing an initial proposal of implementation and realignment of RNAV routes and elimination of a series of conventional routes to optimise the SAM ATS route network (**Appendix A**), and the other containing guidelines on the flexible use of airspace (**Appendix B**), which will be submitted to the consideration of the States of the Region for its use in airspace structure optimisation.

2.13 Both documents are related to ICAO strategic objectives concerning safety and environmental protection, and to the performance objectives of the regional air navigation implementation plan concerning airspace optimisation and the flexible use of airspace.

SAM ATS route network optimisation

2.14 Regarding ATS route network optimisation, and taking into account the lessons learned during the implementation of Phase 2, Version 1 of the SAM ATS route network optimisation programme and the general planning principles established by the SAM Implementation Group (SAMIG), an assessment was made of the best possible paths for a series of RNAV routes, which ICAO will submit to the States of the Region for the implementation of Phase 3, Version 2 of the ATS route network.

2.15 Based on the analysis made, new paths are being proposed to reduce the number of nautical miles in said tracks, thus reducing fuel consumption and CO2 emissions. The ICAO IFSET tool was used to calculate fuel currently used and fuel that would be saved with the implementation of the new paths.

2.16 In general terms and approximate figures, it could be said that fuel consumption in one month of operation in the scenario assessed could be reduced by 1’440,500 kg, accounting for 1.536% of the total currently used. CO2 savings would be in the order of 4’547,658.5 kg, accounting for 0.920% of the amount currently released. If fuel savings are converted to litres, and fuel price per litre is calculated at $ 1.57, savings would reach a figure of $2’713,902 per month.

2.16 In summary, the optimisation of the route network could reduce CO2 emissions released into the atmosphere by approximately 54,572 tonnes per year.

Flexible use of airspace in the South American Region

2.17 As part of the airspace optimisation programme, a recommendation was made to develop guidelines for the implementation of the ICAO flexible use of airspace concept in the South American Region (SAM/FUA guidelines).

2.18 In developing the guidelines, consideration was given to the relevant recommendations of the International Civil Aviation Organization, the Global Air Navigation Plan (Doc 9850), and the guidelines contained in the SAM Performance-Based Air Navigation System Implementation Plan (SAM-PBIP), which specify that an optimum, balanced, and equitable use of airspace by civil and military users would be expedited by strategic coordination and dynamic interaction, thus enabling optimum flight paths while reducing operating costs for airspace users and protecting the environment.

2.19 The SAM/FUA guidelines have been developed for use by SAM States, taking into account operational improvements and airspace optimisation initiatives undertaken in the SAM Region, and particularly the SAM ATS route network optimisation programme, which includes short- and medium-term initiatives on this matter.

3. Suggested action

3.1 The Meeting is invited to:

a) Review the documents shown in **Appendices A** and **B** to this working paper and propose the adjustments it may deem appropriate, with a view to presenting both documents to the ATS/RO/4 meeting for a more in-depth analysis and approval of the proposals;

b) If deemed advisable, adjust the SAM ATS route network optimisation programme implementation action plan shown in **Appendix C** to this working paper, and

c) Request the States, through the Secretariat, to conduct a new traffic data collection in August 2012 in order to obtain updated traffic data.

APPENDIX A

DRAFT

Project RLA/06/901
Assistance for the Implementation of a regional ATM System based on the ATM operational concept and the corresponding technological support for communications, navigation, and surveillance (CNS)

ATS ROUTE NETWORK OPTIMISATION PROGRAMME IN THE ICAO SOUTH AMERICAN REGION (PHASE 3, VERSION 02)

Version 0.0
April 2012

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ATS ROUTE NETWORK OPTIMISATION PROGRAMME IN THE

ICAO SOUTH AMERICAN REGION

(PHASE 3, VERSION 02)

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FOREWORD

The ATS Route Network Optimisation Programme of the ICAO South American Region (SAM ATSRO Programme - Phase 3, Version 02) is published by the ICAO South American Regional Office on behalf of the ICAO South American Regional Implementation Group (SAMIG).

The SAM ATSRO Programme - Phase 3, Version 02 considers the different aspects that States should consider for the introduction of improvements in the ATS route network of the upper airspace and provides some guidelines on terminal areas.

The Regional Office, on behalf of the SAMIG, will publish revised editions of the SAM-ATSRO Programme as required for maintaining a properly updated document.

Copies of the SAM ATSRO Programme - Phase 3, Version 02 may be requested at:

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This edition *(Version 0.0)* includes all other revisions and modifications as of April 2011. Subsequent amendments and/or corrigenda shall appear in the Amendment and Corrigenda Record Table, pursuant to the procedure set forth below.

The publication of amendments and corrigenda is announced regularly through correspondence with the States, International Organisations, and on the ICAO South American Regional Office web site, mandatory reference for those who use this publication. Blank cells are meant to facilitate note-taking.

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS			
Num.	Effective date	Date recorded	Recorded by

CORRIGENDA			
Num.	Effective date	Date recorded	Recorded by

ACRONYMS AND ABBREVIATIONS

ANIP-PB	Performance-Based Air Navigation Implementation Plan
ANP	Air Navigation Plan
ANS	Air Navigation Services
ANSP	Air Navigation Service Providers
ASM	Airspace Management
ATC	Air Traffic Control
ATFM	Air Traffic Flow Management
ATM	Air Traffic Management
ATS	Air Traffic Services
ATSRO	ATS Route Network Optimisation Programme
CAR/SAM	Caribbean/South American Regions
CDO	Continuous Descent Operation
CNS/ATM	Communications, Navigation and Surveillance / Air Traffic Management
CO2	Carbon Dioxide
CTA	Control Area
DME	Distance-Measuring Equipment
FIR	Flight Information Region
FUA	Flexible use of airspace
GANP	Global Air Navigation Plan
GNSS	Global Navigation Satellite System
GREPECAS	CAR/SAM Regional Planning and Implementation Group
IATA	International Air Transport Association
IFALPA	International Federation of Air Line Pilots' Associations
IFATCA	International Federation of Air Traffic Controllers' Associations
IFSET	ICAO Fuel Saving Estimation Tool
PBN	Performance-Based Navigation
RNAV	Area Navigation - RNAV Route: Area Navigation Route
RNP	Required Navigation Performance
RNP AR	Required Navigation Performance Approval Required
SAMIG	South American Region Implementation Group
SARPS	Standards and Recommended Practices (ICAO)
SID	Standard Instrument Departure
SSR	Secondary Surveillance Radar
STAR	Standard Instrument Arrival
TLS	Target Level of Safety
TMA	Terminal Area
VHF	Very High Frequency
VOR/DME	Very High Frequency Omnidirectional Radio Range / Distance-Measuring Equipment

1 Introduction

1.1 Since 2001, the States in ICAO South American Region, together with airspace users, have been continuously working on the introduction of improvements in the airspace structure under their corresponding jurisdiction.

1.2 Since 2008 and with the support of Project RLA 06/901, the SAM Region developed an airspace optimisation programme to maximize the efficient use of airspace, maintaining the safety level required.

1.3 One of the first steps taken in the Region in this respect was the conduction of a feasibility study of an ATS route network that responds to the new aviation requirements and that includes the new performance-based navigation operational concept.

1.4 The feasibility study provided a diagnosis of the ATS route network, developed a strategy for gradual implementation of tasks, prepared a list of deliverables, proposed a work plan, identified the data required and the method for collecting it, defined the support tools needed for executing the task, specified the required reference documentation and other aspects considered as relevant for the execution of the task, such as the interests of every State, geographic characteristics, etc. Additionally to the aforementioned aspects, safety-related matters and other expectations described in the ATM Global Operational Concept were taken into account.

1.5 As a result of the feasibility study, approval was granted to the airspace optimisation programme, which covered two fundamental elements: the optimisation of the ATS route network in the SAM Region and the implementation of performance-based navigation (PBN) in line with GREPECAS guidelines contained in the PBN Roadmap. In order to facilitate project management, both objectives were included in the South American Region ATS Route Network Optimisation Programme (SAM ATSRO Programme).

1.6 The ATSRO Programme seeks to achieve significant improvements in airspace management and organization, taking as a reference the set of the Global Plan Initiatives (GPIs) directly involved in airspace management, which provide the necessary guidelines for planning and implementation of an optimal airspace structure.

1.7 Furthermore, it was agreed that the ATSRO Programme be conducted in phases so as to achieve operational benefits as early as possible and acquire the experience necessary in each of these phases to facilitate programme execution.

1.8 Phase 1 corresponded to RNAV-5 implementation, considering that the implementation of such concept would facilitate optimisation. This phase of the programme was implemented in October 2011. RNAV-5 was implemented in all RNAV routes that existed in the SAM Region; therefore, it is not necessary to extend RNAV-5 airspace volume in an exclusionary manner.

1.9 Likewise, it was agreed that starting in Phase 2 of the programme, the route network version concept would be incorporated, taking into account that airspace structure changes according to air traffic growth, the shifting of air traffic demand from one region or airport to another region or airport, the available technology, among other aspects. The use of route network versions reflects the need for a comprehensive periodic revision aiming at always

guaranteeing the best possible airspace structure. The implementation of Version 01 of the ATS route network was completed satisfactorily in March 2011.

1.10 The SAM Regional Implementation Group, at its eighth meeting (SAMIG/8), held in Lima, in October 2011, reviewed the result of the analysis conducted by the third meeting of the ATS Route Network Optimisation Group (ATSRO/3, Lima, July 2011) with respect to Phases 1 and 2 of the Programme and, particularly, the lessons learned during Phase 2 of the implementation process so as to add said experience to Phase 3 of the programme.

1.11 On the other hand, the SAM performance-based air navigation plan (SAM-ANIP/PB), upon analyzing ATM evolution, acknowledged that it should be based on the following scenarios:

a) En-route Operations;

b) TMA Operations; and

c) Air Operations in general.

1.12 The SAM ANIP/PB defines the gradual strategy required for achieving the identified objective(s) and includes the tasks and activities that better represent the regional planning processes in accordance with the global planning framework. The goal is to achieve a harmonized implementation process evolving towards a seamless regional ATM system. To that effect, a short-term and medium-term work programme was developed, focusing on improvements to the system reflecting a clear commitment of work by the parties involved.

1.13 Among its performance objectives, the SAM ANIP/PB included en-route airspace optimisation (PFF SAM 01), which defined the benefits concerning safety, environmental protection and sustainable development air traffic. This performance objective, in addition to ATS route network optimisation, entails an evolution towards the en-route application of more precise navigation specifications, like requiring RNP2 in selected continental airspaces and RNP4 in oceanic areas.

1.14 With respect to safety, it was noted that en-route airspace optimisation would reinforce airspace safety, and with respect to environmental protection and sustainable development of air traffic, it would reduce miles flown, fuel consumption and, consequently, CO2 emissions into the atmosphere. Also, it would increase airspace capacity and, finally, aircraft capacity is used to fly optimum paths.

Note: PFF SAM 01 establishes as goals the number of implemented PBN routes (RNAV/RNP) and the reduction of CO2 emissions.

1.15 It is worth mentioning that in view of the new methodology *on Aviation System Block Upgrades* (ASBU) promoted by ICAO, the SAM Region will have to update the SAM ANIP-PB, as well as the PFFs, which will be replaced by the Air Navigation Report Forms (ANRF). This new methodology seeks to develop ATM solutions or improvements, taking advantage of current equipment, and establishes a transition plan and enables systems interoperability.

1.16 The aviation system block upgrade concept is a new way of focusing on global, regional and national short-, medium- and long-term planning, seeking to establish the form of

obtaining systems interoperability, more certainty for ATSPs and airspace users with respect to implementation processes, identify benefits in advance and, finally, generate competencies based on the knowledge of equipment manufacturers. The current Global Plan Initiatives (GPIs) will be inserted in the different modules of each block proposed in this methodology.

2 Lessons learned during Phase 2 of ATSRO Programme Implementation

2.1 The Meeting considered that during the implementation process of Version 01 of the ATS route network, some difficulties and other aspects had been identified that had to be considered when analyzing Version 02 of the ATS route network, as shown below:

a) The route network must completely respond to the requirements of all users (civilian, military, general aviation, UAS, etc.). Its implementation would enable most flights to operate on direct routes or as close as possible to direct routes, with a view to uniting origin/destination areas of flights.

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

c) A better airspace sectorization will make it possible to optimise ATC capacity, including the possibility of ATS delegation.

d) Reduced controller workload by reorganizing airspace and applying sectorization wherever necessary.

e) Definition of the type of route (one-way/two-way) and the direction of one-way routes, taking into account the need for more efficient sectorization.

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

g) Use of the Flexible Use of the Airspace Concept (FUA) to ensure that the requirements of all airspace users are considered.

h) Integration with the domestic route network of States.

i) Elimination or reduction of congestion points wherever possible.

j) Minimizing the number of ATS routes, always considering traffic demand in relation to ATS capacity and the possibility of using direct routes.

k) Minimizing the number of crossings and if these crossings are necessary, they must be planned, avoiding highly congested sectors.

l) Avoid redundant ATS routes.

m) Airspace planners and procedure designers shall ensure, by working in coordination, that ICAO SARPS are complied with and, where applicable, air navigation data must include the information contained in Doc 8168 Vol. 2, PANS-OPS.

n) Consider the use of one-way routes, especially in areas where interaction between the climbing/descending traffic is a limiting factor.

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

p) States should avoid taking isolated actions in airspace restructuring or in the domestic ATS route network that may have a significant effect on traffic outside of the area under the jurisdiction of the State involved.

q) Administrations must comply with the agreed dates for the publication of amendments to their respective AIP. In case of non-compliance, the implementation of the route network on the agreed date may be jeopardized, compromising safety.

r) Define, in addition to the effective date, a common and convenient schedule for all of the States for the implementation of the different versions of the ATS route network.

s) The ATS routes working group should set, duly in advance, a deadline for presenting optimisation proposals so as to allow States and users a proper implementation planning.

t) Evaluate the transfer of airspace between States.

2.2 After the discussions and exchange of opinions at SAMIG/8 and considering the experience obtained, the Group introduced a series of improvements to the action plan, Phase 2, Version 02, of the ATSRO Programme.

2.3 One of the essential aspects identified was the need and convenience of conducting a new data collection on aircraft flow in order to analyse the evolution of air traffic demand in the Region for all flights conducted in the upper airspace (FL245 or above) in domestic and international routes during the period from 1-31 August 2011. The information would be submitted to the SAM Regional Office before September 30, 2011. However, only 4 States sent their data (Argentina, Chile, Colombia and Paraguay) and few of the data received could be analyzed since it did not contain the information requested or it was incomplete.

2.4 Another aspect to be noted is that States should have sent to the ICAO SAM Regional Office the information on the gateways of the main TMAs in the Region (see 3.2.3 Phase 3 Action Plan) so as to facilitate the analysis and its incorporation into Version 02 of the ATS route network. However, until the date of this preliminary study, only one State had sent this information.

2.5 SAMIG established a series of general and planning principles that should be considered by State airspace planners, and which were also considered during the analysis conducted in Phase 3, Version 02 of the ATS route network.

3 General Principles

3.1 Listed below are the general principles to be considered during Phase 3, Version 02 of the ATS route network

a) The development of a harmonized and consistent route network requires States to actively participate in the international working groups established for planning or reviewing the regional route network.

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

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

d) Integrate the required routes in order to provide access to the regional route network of/for the airports not served by it. It is also necessary to integrate the required non-permanent routes to relieve air traffic load in the main ATS routes, as well as to ensure optimum flight profiles.

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

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

4 Planning Principles

4.1 The following planning principles were established:

a) Volume of air traffic in the existing routes and in the proposed routes.

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

c) Prioritisation of the planning of areas having more air traffic volume.

d) Satisfaction of the civil and military user needs.

e) Integration of the route network and the supporting sectorization at the beginning of the planning.

f) Integration of the route network and TMA arrival and departure paths (SIDs and STARs).

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

h) Avoid implementing RNAV routes independently, unless absolutely necessary.

4.2 Furthermore, it was recognized that, in addition to the expected growth in air traffic, the challenge for planners when designing the airspace will be, *inter alia*:

a) Meeting ATM demands to ensure that capacity at least maintains the current levels and that delays due to restrictions in the terminal airspace are minimized;

b) Meet safety requirements

c) Meet environmental protection requirements

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

4.3 These guidelines are intended to avoid the tendency to create airspace "independent" of the route network. When designing their TMAs, planners should, in conjunction with PANS / OPS procedure designers, take into account ATC operational requirements, obviously considering the environmental protection and the associated costs and benefits.

4.4 As we have seen, the route network is closely associated with the TMAs and the approach procedures; therefore, it was deemed advisable for TMA design and instrument approaches to take into account the following:

a) The systematic application of FUA and progress made in the implementation of PBN in TMAs and instrument approaches,

b) Safety must be improved or at least maintained at current levels, in compliance with ICAO's SARPS on this topic, performing the appropriate risk analysis,

c) Design must meet operational requirements while maintaining a balance between the interests of ATC, airspace users and the environment, promoting the flexible use of airspace,

d) Airspace design should make use of the collaborative decision-making concept (see Manual on decision-making (CDM) for the SAM Region). Therefore, the proposed redesign of the TMA should build upon a multidisciplinary team of specialists with representatives of all stakeholders,

e) The terminal area should be designed to be an integral part of the airspace from the horizontal and vertical point of view to ensure a continuous flow of operations,

f) To use continuous descent techniques to maximize operational efficiency between the requirements and restrictions in the airspace concerned, establishing optimized arrivals as much as possible (Doc 9931).

g) The States should submit their airspace optimisation plans at the SAMIG and ATSRO meetings.

5 Flexible use of airspace

5.1 There is a regional agreement that, in order to achieve a comprehensive ATS route network serving the interests of all users, including commercial, military, general, sports aviation and unmanned aircraft systems, it is necessary to establish a civil/military cooperation system to analyze all the restricted, prohibited and danger areas that have been established in the South American region in order to implement the flexible use of airspace concept.

5.2 Furthermore, it was recognized that the analysis is not intended to eliminate or reduce arbitrarily the allocated special use airspace, but to implement the collaborative decision making concept, leading to the search for better options that will satisfy all airspace users and ensure that needs are addressed, regardless of the application of airspace restrictions.

5.3 Following this, Project RLA 06/901, at the request of SAMIG, and with the assistance of two experts, developed the Guidelines for the Implementation of the Flexible Use of Airspace Concept (FUA) in the South American Region (SAM/FUA Guidelines). These guidelines is presented in the relevant regional bodies for evaluation and, if appropriate, its implementation at regional level.

6 Tools and equipment used during the analysis of the SAM ATS route network

6.1 For the purpose of performing the analysis, two main tools were used, Jeppesen FliteStar provided by the Regional Office and the Google Earth software that was used by the experts of Project RLA 06/901 to study DME/DME coverage where upper space ATS routes had been incorporated. In order to use the latter tool, it was necessary to update the data on new routes implemented after the aforementioned work.

6.2 We also used Jeppesen and DOD aeronautical charts and the aeronautical charts published by the States.

6.3 As stated in the ATS route network optimization action plan, once Phase 3, Version 02 of the ATS route network had been analyzed by the States of the Region and airspace users prior to implementation, it should be assessed using "airspace modelling" and accelerated time ATC simulation tools. This task will assess how the aircraft operation could be affected in the new scenario and, if necessary, take additional steps before implementation.

6.4 Before implementation, it will also be necessary to conduct a risk analysis to ensure that the new version of the route network will not create additional and/or residual safety risks in the system. This risk analysis shall not replace in any way the safety assessment that each State must perform in accordance with the ICAO SARPS.

6.5 In absence of updated information, available 2009 information had to be used, year in which a compilation of aircraft movements in the region had been made to assess the possibility of implementing RNAV 5. These data was updated for 2010 with a 6% increase and a similar figure for data resulting from the previous increase in 2011. While such information is not accurate, it is the only one available to perform a rough traffic flow analysis in the region. The resulting data are listed in **Appendix A**.

6.6 Likewise, and in absence of information from the entry and exit points of the main terminal areas of the region, we took into account the traffic flow shown on aeronautical charts available.

6.7 Despite asking States to submit information on plans for the optimisation of their airspace, except for two States, no information was received on such plans. Therefore, the assessment was based on information available from the ATS/RO and SAMIG meetings as well as on information received from an airline that requested an analysis of some paths that could be improved.

6.8 In order to assess fuel savings and environmental benefits resulting from the new proposed path, the ICAO IFSET tool was used. The result of this task is for reference purposes and in the absence of SIDs and STARs, it was not possible to conduct a full assessment. Once the final paths

and SIDs and STARs connecting with the new paths have been defined, a new assessment of fuel savings and the corresponding environmental benefits should be conducted.

7 Statistical data on air traffic flow and fleet capacity

7.1 The analysis of the route network based on statistical traffic data has resulted in a database that has enabled a diagnosis of major air traffic flows in the SAM Region, defined by the number of transactions recorded along the different routes, whether RNAV or ATS routes.

7.2 The analysis covered the following aspects to be described in general terms and which can be seen in Appendix A and Attachment 1 to said Appendix, individualized for each FIR.

Number of flights per city pair

7.3 The number of flights per city pair has enabled the identification of the main air traffic flows in the SAM Region, and based on this assessment, a proposal for implementation of RNAV routes with paths as direct as possible or otherwise their removal, realignment, or extension, or the implementation of new or parallel routes, and the reorganization of traffic flow paths.

Number of flights on each ATS route

7.4 The number of flights on each ATS route provides information on the number of operations in each of them, indicating the individual and cumulative percentages of each route over the total sample. This information is important because it shows whether routes are being used, thus permitting an opinion as to whether they should continue to operate or not.

7.5 When reviewing the number of operations per route, it was determined that those routes with the greatest flow have such a flow because they were implemented in FIRs with the largest number of operations, crossing several FIRs, thus increasing the number of users on the respective routes. Based on this, the feasibility of improving capacity by reorganizing flows by implementing parallel routes was determined.

City pairs served by each ATS route

7.6 The combination of the number of flights per city pair with the number of flights in each ATS route enabled the identification of city pairs served by each ATS route. These values enable an analysis of traffic flows between each city pair and route, facilitating the realignment of routes while implementing parallel routes and redirecting the existing traffic flow.

7.7 This aspect takes into account the major flows between cities with the largest number of movements in order to identify situations where it would be wise to implement parallel routes so as to allow better use by optimizing the airspace concerned.

7.8 The identification of these flows between city pairs points to the need to reorganize the direction of traffic flows in some cases; this will allow a substantial improvement in airspace capacity and will contribute to its optimisation.

7.9 In this context, the existence was identified of routes between city pairs that were not representative enough of prevailing traffic to keep said routes; it would be necessary to analyze the possibility of eliminating them or otherwise turning these routes into temporary routes, depending on their sparse use, in case there is no intention to eliminate them.

7.10 The main flows between city pairs offer the benefits of PBN procedures, as seen in airspaces with high traffic density, which benefit from the implementation of parallel routes with a sense of diverted traffic, that is unidirectional; thus, optimizing the capacity of the area concerned.

Number of flights per aircraft operator

7.11 The data contained in this part, allows visualizing the companies or operators with the number of operations and type of aircraft used in the region.

7.12 We noticed that the aircraft fleet operating in the region has improved dramatically in the sense that they are mostly new-generation aircraft, contributing to improvements in airspace structure.

Number of flights per flight level

7.13 The analysis of the number of flights per flight level revealed the most frequently requested flight levels in the different operations across the region.

7.14 In order to meet the growing demand for optimum flight profiles, it would be interesting if service providers would take into account the facilities offered by continuous descent or climb procedures applied to flight paths with major flows and address them by implementing parallel routes with a defined traffic direction for arrivals and departures, thus increasing the airspace capacity.

8 Diagnosis of the SAM ATS Route network and resulting proposals

8.1 In view of the above, the current ATS route network in the upper airspace was studied in order to propose States a tentative improvement to the route network.

8.2 State and airspace user requests with respect to given routes/paths were addressed first.

8.3 The available traffic sample was compared with the SAM ATS route network as published in the CAR/SAM ANP, where 167 routes are shown, defining the volume of traffic in each route.

8.4 Subsequently, 86 routes were analysed from their point of origin to destination, assessing course and distance with FliteStar. Based on available information, consideration was given to the number and type of aircraft most used on the route in question to finally analyze the advantages and/or disadvantages of a new route, the realignment of some and the tentative removal of routes that offered no operational advantage and/or were not used or had low use by airspace users.

8.5 Most of the routes evaluated were those with paths within the region; however, in some cases we reviewed routes that affected other regions. In these cases, we looked for a point of entry to the adjacent region in order not to affect the structure of its route network.

8.6 Notwithstanding the above, States may assess the convenience of proposing changes affecting adjacent regions that could then be coordinated by the ICAO Secretariat.

8.7 Taking into account the principles established by SAMIG, after that initial analysis, an assessment was made of the best possible path, weighing advantages and disadvantages, and where applicable, a number of RNAV routes were proposed for State analysis.

8.8 In this preliminary analysis 45 routes were identified that could improve the regional airspace structure. The Route Table analyzed for the SAM Region that is suggested for evaluation, with a detailed description of the aspects deemed important and that could assist in making a decision, is shown **Appendix B** in this report.

8.9 This description includes the scenario with cities of origin and destination, the route that is normally used today, the distance, the number of flights and aircraft types most used in said leg. It also proposes a new path, the distance for the new path, the number of nautical miles saved and the reduced fuel consumption and CO2 emissions resulting from the new path. Finally, we list the States involved in the new proposed path and if applicable, we include observations corresponding to the evaluated path.

8.10 As mentioned above, in order to calculate the fuel currently used and the fuel that would be saved if the new paths were implemented, the ICAO IFSET tool was used.

8.11 In the absence of SIDs and STARs that link the route with the departure and arrival airports, calculation was based on the estimate of total distance between the points involved, the aircraft remaining at FL 360 all the time, which is the most representative level used in the Region. That is to say, the climb and descent phases were not taken into account.

8.12 Calculations were conservative since only operations whose source and destination was on the proposed path were considered, disregarding other operations on the route concerned. For example, flights over adjacent regions along that path were not taken into account.

8.11 The conversion factor of 3,157 per kg. of fuel approved by the Intergovernmental Panel on Climate Change (IPCC) was used for calculating CO2 emissions.

8.13 In general and approximate figures, it could be said that fuel consumption in one month of operations in the scenario in question could be reduced by 1’440,500 kg., *i.e.*,1.536% of the total, and the reduction of CO2 emissions would be 4’547,658.5 kg, *i.e.*, 0.920%. If fuel savings is expressed in litres, and the price per litre of fuel is $1.57, savings would reach $2’713,902 per month. For easier reference, **Appendix C** includes the Table of fuel savings, with estimates made for each of the proposed paths.

8.14 Attachment 1 to Appendix A also contains the routes that should be analyzed in light of their low occupancy or lack of information on operations on said routes. States should check if it is relevant to maintain the route or, if applicable, propose its removal from the corresponding air navigation plan.

9 Application of techniques for Continuous Descent Operations (CDO)

9.1 The steady decline is one of several tools that aircraft operators and ANSPs have at hand to improve safety, flight prediction capability, and airspace capacity, while reducing time, noise, ATC/Pilot communications, combustion and greenhouse emissions. Over the years, different route models have been developed to facilitate continuous descent, and several attempts have been made to strike a balance between having environmentally friendly procedures and the requirements of a given airport or airspace.

9.2 Phase 3 Version 02 of the route network requires States to analyze the application of CDO techniques. It is recognized that these continuous descent (CD) operations are possible by virtue of airspace design, procedure design and ATC facilitation, where an incoming aircraft descends continuously to the extent possible using minimum engine thrust, ideally in a low drag setting prior to the final approach fix (FAF) / final approach point (FAP).

9.3 The application of CDO should be examined on a case-by-case basis depending on the particular requirements at each airport in the region, taking into consideration that an optimal CD starts at the top of descent point and uses descent profiles that reduce ATC/pilot communication, levelled flight segments, noise, combustion and emissions, while increasing ATC/pilot prediction capability and flight stability.

9.4 It is very important to maintain safety during all flight phases. Nothing contained in the guidance shall prevail over the requirement for a safe operation and aircraft control at all times. To avoid doubt, all recommendations should be understood as "subject to the safety requirements". Before starting any testing or CD operation, the proposed implementation should be subject to a safety assessment at local level.

9.5 In order to standardize and harmonize the development and implementation of CD operations, the airspace design and instrument flight procedures, as well as ATC techniques should be used consistently. This will enable flight crews to use in-flight techniques to reduce the overall environmental footprint and increase the efficiency of commercial aviation. Complete information on the application of the CDO techniques can be found in ICAO Doc 9931, Continuous Descent Operations Manual.

10 Interface between the SAM route network and the route network in adjacent regions

10.1 One of the complexities of optimizing the ATS route network is the interface with adjacent regions. For a comprehensive improvement of the route network, States must analyze changes and amendments on a bilateral or multilateral basis, depending on the circumstances. In many cases, it is necessary to also include improvements in the Letters of Operational Agreement between ATC units, as well as in the corresponding ATS contingency plans.

10.2 In SAM Region, this has been achieved through SAMIG and ATS/RO meetings sponsored by Project RLA 06/901 that provides the appropriate scope to carry out the necessary analysis of each proposal, but said facility is not available with the States of adjacent regions.

10.3 To overcome this difficulty, the ICAO Secretariat, through its official channels, usually coordinates as necessary with those involved to resolve any problems that may arise in the implementation process. If there were improvements to be made that affect or could potentially affect States in other Regions, the Secretariat encourages the holding of bilateral and multilateral meetings.

10.4 In addition to the above, consideration could be given to the advisability of holding larger inter-regional meetings in selected periods and according to the process of implementing the SAM ATSRO Programme to explore ways to improve the ATS route network at a more extensive and deeper level.

11 Initial draft of the proposed amendment to the CAR / SAM ANP

11.1 This paper is an initial proposal that should be assessed by States and in general by the ATM community. It is at a very early stage and will undergo various changes, so it would not be appropriate to prepare an initial draft proposal of amendment to the CAR/SAM ANP.

11.2 However, for information purposes, **Appendix D** includes the format to be used to circulate the proposed amendment to the plan once the paths, geographic coordinates and other data needed to process the amendment are defined.

……o……..

Apéndice A al Adjunto 1 / Attachment 1 to Appendix A

Resumen del movimiento de aeronaves por ruta / Summary of aircraft movement per route

N°	RUTA Route	VUELOS Flights	N°	RUTA Route	VUELOS Flights	N°	RUTA Route	VUELOS Flights
1	UA300	718	26	UA555	270	51	UB696	57
2	UA301	782	27	UA556	584	52	UG427	166
3	UA304	1150	28	UA558	156	53	UG430	30
4	UA305	190	29	UA561	193	54	UG431	1264
5	UA306	1157	30	UA562	3	55	UG432	166
6	UA307	893	31	UA563	137	56	UG434	107
7	UA310	3070	32	UA567	328	57	UG436	1659
8	UA312	4203	33	UA570	349	58	UG437	3843
9	UA315	1538	34	UA573	43	59	UG438	145
10	UA317	4374	35	UA574	497	60	UG439	326
11	UA318	*NI	36	UA632	3	61	UG440	992
12	UA319	747	37	UB510	100	62	UG442	81
13	UA320	424	38	UB554	509	63	UG443	680
14	UA321	3131	39	UB555	184	64	UG444	11
15	UA322	85	40	UB556	*NI	65	UG445	151
16	UA323	506	41	UB560	107	66	UG446	1112
17	UA324	117	42	UB623	91	67	UG447	461
18	UA502	10	43	UB652	51	68	UG448	131
19	UA511	69	44	UB681	5	69	UG449	851
20	UA516	698	45	UB682	2	70	UG550	276
21	UA550	5426	46	UB684	123	71	UG551	1
22	UA551	243	47	UB687	*NI	72	UR505	17
23	UA552	2528	48	UB688	306	73	UR550	50
24	UA553	1312	49	UB689	517	74	UR554	46
25	UA554	260	50	UB690	11	75	UR559	17
* Sin Información, analizar eliminación / Without information, analyse elimination								

N°	RUTA Route	VUELOS Flights	N°	RUTA Route	VUELOS Flights	N°	RUTA Route	VUELOS Flights
76	UR564	21	101	UL337	240	126	UM415	886
77	UR567	7	102	UL340	66	127	UM417	32
78	UR640	400	103	UL344	213	128	UM418	80
79	UR683	*NI	104	UL375	9	129	UM419	339
80	UL201	574	105	UL401	230	130	UM423	168
81	UL206	614	106	UL404	200	131	UM424	633
82	UL211	*NI	107	UL417	1061	132	UM525	182
83	UL216	33	108	UL423	324	133	UM527	*NI
84	UL224	45	109	UL465	1101	134	UM529	296
85	UL300	182	110	UL474	59	135	UM530	*NI
86	UL301	175	111	UL540	426	136	UM532	*NI
87	UL302	837	112	UL550	1840	137	UM534	*NI
88	UL304	875	113	UL650	*NI	138	UM538	15
89	UL305	867	114	UL655	797	139	UM540	2662
90	UL306	857	115	UL695	19	140	UM542	6
91	UL308	488	116	UL775	*NI	141	UM544	1
92	UL309	77	117	UL776	1083	142	UM548	1073
93	UL310	309	118	UL780	4803	143	UM654	557
94	UL312	67	119	UL793	509	144	UM656	22
95	UL318	36	120	UL795	2101	145	UM659	182
96	UL322	85	121	UM400	525	146	UM661	*NI
97	UL324	286	122	UM402	278	147	UM664	123
98	UL327	118	123	UM403	13	148	UM665	*NI
99	UL330	*NI	124	UM409	661	149	UM668	*NI
100	UL335	27	125	UM414	817	150	UM671	1022
* Sin Información, analizar eliminación / Without information, analyse elimination								

N°	RUTA Route	VUELOS Flights	N°	RUTA Route	VUELOS Flights	N°	RUTA Route	VUELOS Flights
151	UM674	*NI						
152	UM776	*NI						
153	UM782	1336						
154	UM784	*NI						
155	UM787	171						
156	UM788	2315						
157	UM789	85						
158	UM791	*NI						
159	UM792	253						
160	UM793	*NI						
161	UM795	*NI						
162	UM796	139						
163	UM799	1242						
164	UN741	1254						
165	UN857	1901						
166	UN866	1371						
167	UN873	1374						

* Sin Información, analizar eliminación / Without information, analyse elimination

Rutas que en la muestra presentan datos pero no se encuentran en el ANP
Routes which present data in the sample but are not contained into the ANP

N°	RUTA Route	VUELOS Flights	FIR	N°	RUTA Route	VUELOS Flights	FIR
1	UA325	1	VEN				
2	UA332	1	GUY				
3	UA334	1	VEV				
4	UA342	1	GUY				
5	UA432	45	BRA				
6	UA432	78	URU				
7	UA432	1	VEN				
8	UA432	1	GUY				
9	UA360	2	ARG				
10	UA397	1	ARG				
11	UA411	1	VEN				
12	UA511	69	VEN				
13	UA516	698	VEN				
14	UA517	1	VEN				
15	UA531	1	VEN				
16	UG426	2550	ECU, PAN, PER				
17	UR551	9	BRA				
18	UR558	1	BRA				
19	UR563	8	BRA				
20	UL437	1	PAN				
21	UL511	1	VEN				
22	UL707	1	BOL				
23	UL743	1	BOL				
24	UL797	38	BOL				
25	UM786	128	SUR				
26	UN797	1	VEN				
* Sin Información, analizar eliminación / Without information, analyse elimination							

Apéndice B

Planilla de Rutas analizadas en la Región SAM

01	**Buenos Aires /Sao Paulo (Unidireccional)**	
Ruta actual (FliteStar)	UA 305 UN857 UM671 RONUT	Notas:
Distancia actual	898 NM	
*Número de vuelos mensuales	722	
*Tipo de aeronave más utilizada	A320, A330, B735, B737, B738, B744, B763, MD88, LJ45	
Trayectoria propuesta	Desde WPA1 S34.38.54.59/W57.43.23.69 a ASONO	Desde un nuevo punto a 20 NM Sur de PAPIX WPA1 (S34 38.54.59 / W57.43.23,69) o a partir de DORVO a ASONO (TMA Sao Paulo)
Distancia de trayectoria propuesta	837 NM	
Millas reducidas	61	
Reducción de Combustible// CO2 aproximado	-249600/787987,2	
Estados involucrados	Argentina, Brasil, Uruguay	
Observaciones	Esta ruta se corresponde con la solicitada por LAN	
*De acuerdo a información disponible		
Esta ruta atiende un flujo importante de operaciones entre Buenos Aires y Sao Paulo, por lo que sería interesante implantar una paralela saliendo de un punto a 20 NM Sur de PAPIX, denominado WPA1 en la siguiente coordenada (S34 38.54.59 / W57.43.23,69) o en otra variante a partir de la posición DORVO a ASONO en TMA Sao Paulo		

02	**Sao Paulo/Buenos Aires (Unidireccional)**	
Ruta actual (FliteStar)	UM788, UN741	Notas:
Distancia actual	930	
*Número de vuelos	777	
*Tipo de aeronave más utilizada	A320, A330, A332, B735, B737, B738, B744, B763, MD88, LJ45	
Trayectoria propuesta	CURSE TMA SAO PAULO A PAPIX TMA SAEZ	
Distancia de trayectoria propuesta	914	CGO/EZE
Millas reducidas	16	
Reducción de Combustible// CO2 aproximado	-65500/ 206783,5	
Estados involucrados	Argentina, Brasil, Uruguay	
Observaciones	Esta ruta se corresponde con la solicitada por LAN	
*De acuerdo a información disponible		

Como ruta paralela de llegada desde Sao Paulo A buenos Aires, el ahorro de milla no es muy preponderante como la ruta de salida anteriormente propuesta pero en definitiva contribuye en el ahorro, el trayecto propuesto es de posición CURSE en la TMA SAO PAULO directo a PAPIX punto de ingreso a la TMA SAEZ

03	**Rio/Buenos Aires**	
Ruta actual (FliteStar)	UN857,UM534, UN741	Notas: Ruta bidireccional hasta SBPA, luego unidireccional a Rio
Distancia actual	1090	
*Número de vuelos	572	
*Tipo de aeronave más utilizada	A320, A319, A318, B735, B738, CR9	
Trayectoria propuesta	EZE/DORVO/BITAK/EFS	
Distancia de trayectoria propuesta	1083	
Millas reducidas	7	
Reducción de Combustible// CO2 aproximado	-49100/ 155008,7	
Estados involucrados	Brasil, Uruguay, Argentina	
Observaciones		
*De acuerdo a información disponible		

Esta ruta es bidireccional hasta Porto Alegre. Luego unidireccional de sur a norte. La pregunta es ¿Cómo se planifican los vuelos de Rio a BsAs?

Por tanto una opción aplicable sería: saliendo de Bs As a la posición DORVO y directo a BITAK punto de ingreso para Rio en el sector, podría servir también como ruta alterna de Carrasco a Rio. El flujo de transito es relativamente alto y el ahorro en millas es representativo comparado con el número de operaciones

04	**Mdeo/ Sao Paulo (Unidireccional)**	
Ruta actual (FliteStar)	UM540, UM671,	Notas:
Distancia actual	852	
*Número de vuelos	224	
*Tipo de aeronave más utilizada	A320, B744, CRJ9	
Trayectoria propuesta	CRR/KILUM/WPU2/ANISE/RDE/CGO	Realinear UM661 a WPU1 (33°50'34.51"S 54°37'5.03"W) unidireccional Sur/Norte a ANISE
Distancia de trayectoria propuesta	843	
Millas reducidas	9	
Reducción de Combustible// CO2 aproximado	-16900/ 53353,3	
Estados involucrados	Uruguay, Brasil	
Observación	Ruta paralela 20 NM, a la opción 04-B	
*De acuerdo a información disponible		

Alternativa ¨B¨: eliminar UM 540 y establecer una nueva Ruta con la siguiente trayectoria: UM661 hasta coordenadas 33.49.5S/54.36.9W (WPU2) de allí Unidireccional SUR/NORTE directo a ANISE.

Ventaja: esta nueva ruta es paralela (20 NM lateral) a la ruta de llegada en el tramo NEROK/ TELAK (Distancia 784 NM CRR a ANISE)

05	**Mdeo/ Rio de Janeiro**	
Ruta actual (FliteStar)	UM540, UN857,	Notas:
Distancia actual	989	
*Número de vuelos	67	
*Tipo de aeronave más utilizada	CRJ9	
Trayectoria propuesta	UM661 O UN857 luego de TELAK a NEROK	
Distancia de trayectoria propuesta	986	
Millas reducidas	3	
Reducción de Combustible// CO2 aproximado	-700/ 2209,9	
Estados involucrados	Uruguay, Brasil	
Observación		
*De acuerdo a información disponible		
En este trayecto puede utilizarse la RNAV existente, UM661 para posterior ingresar por una STAR o por la UN857 hasta interceptar la trayectoria de la ruta entre TELAK a NEROK y seguir por esta a Rio		

06	**Sao Paulo/ Santiago (Unidireccional)**	
Ruta actual (FliteStar)	UL310, UM400, UA307, UA306	Notas:
Distancia actual	1419	
*Número de vuelos	332	
*Tipo de aeronave más utilizada	A319, A320, B738, B763, B773	
Trayectoria propuesta	Ruta Unidireccional, sentido DORMI a UNKAL	
Distancia de trayectoria propuesta	1402	
Millas reducidas	17	
Reducción de Combustible// CO2 aproximado	-70500/ 222568,5	
Estados involucrados	Brasil, Uruguay, Argentina, Chile	
Observación	Propuesta basada en pedido de Brasil para disponer de rutas paralelas de TMA Sao Paulo/Rio y al pedido de LAN en esos tramos	
*De acuerdo a información disponible		

Nueva Ruta Unidireccional, sentido Sao Paulo a Santiago entre posición DORMI a UNKAL, sirviendo de salida de la TMA San Paulo o Rio, además tanto Brasil como LAN han solicitado el trayecto en cuestión, puede apreciarse de hecho un ahorro 17 NM del trayecto actualmente utilizado y la RNAV propuesta

07	**Santiago/ Sao Paulo (Unidireccional)**	
Ruta actual (FliteStar)	UA307, UM400, UW6, UM548, UW47	Notas:
Distancia actual	1441	
*Número de vuelos	344	
*Tipo de aeronave más utilizada	A319, A320, B735, B765, B773	
Trayectoria propuesta	Ruta Unidireccional, de NEBEG a ASONO/ REKIR/ UM400	
Distancia de trayectoria propuesta	1422	
Millas reducidas	19	
Reducción de Combustible// CO2 aproximado	-81600/ 257611,2	
Estados involucrados	Brasil, Uruguay, Argentina, Chile	
Observación	Propuesta basada en pedido de Brasil para disponer de rutas paralelas de TMA Sao Paulo/Rio y al pedido de LAN en esos tramos	
*De acuerdo a información disponible		

Nueva Ruta Unidireccional, de NEBEG a ASONO.

Se eliminaría UM400 tramo REKIR Córdoba y se mantiene UM400 de REKIR a Rio o de lo contrario realinear y extender la UM400 hasta NEBEG y hacerlo unidireccional con sentido Santiago-Rio

De este modo se estaría satisfaciendo las demandas de usuarios y reordenando el flujo de los tránsitos permitiendo un mejor aprovechamiento de las trayectorias.

08	**Buenos Aires/Santiago**	
Ruta actual (FliteStar)	UA306,	Notas:
Distancia actual	637	
*Número de vuelos	773	
*Tipo de aeronave más utilizada	A319, A320, B738, B763, B773	
Trayectoria propuesta	Trayectoria directa de NUXIM a UMKAL	
Distancia de trayectoria propuesta	635	
Millas reducidas	2	
Reducción de Combustible// CO2 aproximado	-19100/ 60298,7	
Estados involucrados	Argentina, Chile, Uruguay	
Observación		
*De acuerdo a información disponible		
Esta ruta será de utilidad tanto para las salidas de BsAs como de Carrasco. Saliendo de Carrasco por la UA306 hasta posición NUXIM, luego la ruta propuesta hasta UMKAL		

09	**Santiago/ Buenos Aires**	
Ruta actual (FliteStar)	UM424	Notas:
Distancia actual	630	
*Número de vuelos	773	
*Tipo de aeronave más utilizada	A319, A320, B738, B763, B773	
Trayectoria propuesta	ALBAL a ASADA	
Distancia de trayectoria propuesta	628	
Millas reducidas	2	
Reducción de Combustible// CO2 aproximado	-19100/ 60298,7	
Estados involucrados	Argentina, Chile	
Observaciones	Realinear y extender UM424	
*De acuerdo a información disponible		

Realinear la UM424 desde posición ALBAL a posición ASADA evitando pasar por VOR SRA (San Rafael), así se obtiene una ruta más directa representando por lo menos un ahorro de 2NM.

Esta ruta será de utilidad para entrada a Montevideo. Extendiendo la UM424 hasta posición DORVO para el ingreso al TMA Carrasco o como segunda opción desde ASADA a TIGRE

10	**Lima/ Sao Paulo (Unidireccional)**	
Ruta actual (FliteStar)	UM415, UW50, UA304, UA320	Notas:
Distancia actual	1884	
*Número de vuelos	205	
*Tipo de aeronave más utilizada	A319, A320	
Trayectoria propuesta	EGLAS, VIRU VIRU, BAURU a TMA Sao Paulo	
Distancia de trayectoria propuesta	1876	
Millas reducidas	8	
Reducción de Combustible// CO2 aproximado	-20100/ 63455,7	
Estados involucrados	Brasil, Bolivia, Perú	
Observación	Las distancias no contemplan tramo Sao Paulo a Rio	
*De acuerdo a información disponible		

La ruta podría iniciarse en EGLAS a la salida del TMA Lima directa a VOR ViruViru luego a VOR BAURU llegando a la TMA Sao Paulo. Posteriormente el tramo interno en la TMA Sao Paulo, debería ser analizado por sus planificadores. Esta ruta también servirá a La Paz, Santa Cruz y Cochabamba por medio de SID y STAR

11	**Sao Paulo/Lima**	
Ruta actual (FliteStar)	UW50, UM415, UA304, UA320	Notas:
Distancia actual	1883	
*Número de vuelos	205	
*Tipo de aeronave más utilizada	A319, A320	
Trayectoria propuesta	VOR SCB a VOR ASIA	Realineamiento de la UM415 de SCB a ASIA
Distancia de trayectoria propuesta	1879	
Millas reducidas	4	
Reducción de Combustible// CO2 aproximado	-10000/ 31570	
Estados involucrados	Brasil, Bolivia, Perú	
Observación	No contempla distancia Rio - Sao Paulo	
*De acuerdo a información disponible		

La UM 415 actualmente con su configuración, tiene una extensión de 1842NM

Realineando la UM 415 desde el VOR SOROCABA directo a VOR ASIA y una STAR Lima (Distancia 1777NM +54 1831NM), se obtiene un ahorro de 11 NM

NOTA: Tanto si se implementa una nueva RNAV o se realinea la UM 415 pueden servir también a La Paz, Santa Cruz (Viru Viru) y Cochabamba mediante conexiones con SID y STAR

Esta Ruta también servirá a Rio, La Paz, Santa Cruz y Cochabamba por medio de SID y STAR

12	**Sao Paulo/Bogotá**	
Ruta actual (FliteStar)	UM782, UL655	Notas:
Distancia actual	2368	
*Número de vuelos	230	
*Tipo de aeronave más utilizada	B767	
Trayectoria propuesta	Reorganizar flujo de transito utilizando rutas existentes	UM782, UL655
Distancia de trayectoria propuesta	NO HAY REDUCCIÓN	
Millas reducidas		
Reducción de Combustible// CO2 aproximado	0/0	
Estados involucrados	Brasil, Colombia	
Observación	Modificar la dirección de la UM782 desde PARDO hacia el Norte como bidireccional, ya lo es en FIR Bogotá	
*De acuerdo a información disponible		

Parecería que no es necesaria una ruta paralela a las rutas mencionadas ya que existen varias rutas RNAV que podrían utilizarse. Se propone reorganizar el flujo y utilizar las rutas existentes. Se sugiere estudiar la posibilidad de modificar la dirección de la UM 782 desde PARDO hacia el norte como bidireccional. (ya es bidireccional en la FIR Bogotá) Haciendo la reorganización se obtendrá una reducción de entre 10 y 18 NM

Las UM 782 y UL 655 son dos rutas que SALEN de TMA Sao Paulo y van a Centroamérica y Cali respectivamente (sigue hacia Centroamérica).

13	**Sao Paulo/ Caracas**	
Ruta actual (FliteStar)	UL304, UW27, UM417	Notas:
Distancia actual	2408	
*Número de vuelos	49	
*Tipo de aeronave más utilizada	B738	
Trayectoria propuesta	UM417 MIQ, TUY, BRU	Realinear MIQ, TUY, Baurú
Distancia de trayectoria propuesta	2388	
Millas reducidas	20	
Reducción de Combustible// CO2 aproximado	-12000/ 37884	
Estados involucrados	Brasil, Venezuela	
Observación		
*De acuerdo a información disponible		
Será interesante analizar la posibilidad de realinear y extender la UM417 de modo a obtener mayor y mejor aprovechamiento del tramo existente, así mismo observar el sentido de circulación del tránsito para optimizar los resultados		

14	**Asunción/Bs As**	
Ruta actual (FliteStar)	UA556, UW64, UW65, UW11	Notas:
Distancia actual	587	
*Número de vuelos	400	
*Tipo de aeronave más utilizada	A320, B727, B738, F900	
Trayectoria propuesta	WPY1 (26° 4'18"S 057°35'54"W) a VOR GUA	Bidireccional
Distancia de trayectoria propuesta	577	
Millas reducidas	10	
Reducción de Combustible// CO_2 aproximado	-49100/ 155008,7	
Estados involucrados	Argentina, Paraguay	
Observación	Analizar la posibilidad de eliminar la UA556 con un periodo de evaluación de tres meses	
*De acuerdo a información disponible		
Con vistas a mejorar las trayectorias y atendiendo la cantidad de operaciones en este tramo, considerar la opción de eliminar la UA556 o realinearla i convertirla en RNAV		

15	**Lima/Mdeo**	
Ruta actual (FliteStar)	UL550, UW7, UA558, UW8, UB555	Notas:
Distancia actual	1823	
*Número de vuelos	54	
*Tipo de aeronave más utilizada	A319, A320	
Trayectoria propuesta	UL550/VOR TUC/ VOR ERE/ NIMBO	Bidireccional
Distancia de trayectoria propuesta	1790	
Millas reducidas	33	
Reducción de Combustible// CO_2 aproximado	-25100/ 79240,7	
Estados involucrados	Perú, Chile, Argentina, Uruguay	
Observación		
*De acuerdo a información disponible		
En esta trayectoria propuesta se		

16	**Lima/Asunción**	
Ruta actual (FliteStar)	UA320	Notas:
Distancia actual	1387	
*Número de vuelos	62	A partir del 20 de marzo Taca está realizando Vuelos diarios Lima – ASU - Lima
*Tipo de aeronave más utilizada	A319	
Trayectoria propuesta	VOR VAS/ VOR EQU/ UM793/ VOR ASIA/LIMA	Del VOR VAS a WPY2 (24°47'48.00"S 058°17'42.00"W) a PILCO (Punto de Transferencia FIR Resistencia/ La Paz) al VOR AREQUIPA y se empalma con la UM793 hasta VOR ASIA y de allí a LIMA
Distancia de trayectoria propuesta	1368	
Millas reducidas	19	
Reducción de Combustible// CO2 aproximado	-14500/ 45776,5	
Estados involucrados	Perú, Bolivia, Argentina, Paraguay	
Observación	*Al tiempo de la toma de muestra, no existían vuelos, ahora se cuenta con 62 vuelos mensuales	
*De acuerdo a información disponible		

17	**Lima/Foz Iguacu**	
Ruta actual (FliteStar)	UA320, UM548	Notas:
Distancia actual	1553	
*Número de vuelos	62	
*Tipo de aeronave más utilizada	A319, DC10	
Trayectoria propuesta	VOR ASIA/ BITUR	Bidireccional de LIMA al VOR ASIA a la Posición BITUR de la TMA FOZ (STAR para SGES, SBFI, SARI)
Distancia de trayectoria propuesta	1528	
Millas reducidas	25	
Reducción de Combustible// CO2 aproximado	-19000/ 59983	
Estados involucrados	Perú, Bolivia, Paraguay, Brasil	
Observación	*Al tiempo de la toma de muestra, no existían vuelos regulares, actualmente se registran vuelos de carga entre SPIM/SGES y de pasajeros entre SPIM/SBFI. Igualmente esta ruta puede servir a Asunción, Cataratas y Guaraní	
*De acuerdo a información disponible		

18	**Lima/Santiago**	
Ruta actual (FliteStar)	UL302, UG551, UT112	Notas:
Distancia actual	1335	
*Número de vuelos	349	
*Tipo de aeronave más utilizada	A319, A320, A343, B763	
Trayectoria propuesta	VOR ASIA/ VOR TABON	Realinear la UL302 de la trayectoria Lima/Tongoy a VOR ASIA/ VOR TABON
Distancia de trayectoria propuesta	1331	
Millas reducidas	4	
Reducción de Combustible// CO2 aproximado	-17100/ 53984,7	
Estados involucrados	Perú, Chile	
Observación		
*De acuerdo a información disponible		

19	**Lima/BsAs**	
Ruta actual (FliteStar)	UL550, UA558, UW24	Notas:
Distancia actual	1715	
*Número de vuelos	570	
*Tipo de aeronave más utilizada	A319, A320, B738, B763, B773	
Trayectoria propuesta	UL550/ VOR CALAMA/VOR ASIA	
Distancia de trayectoria propuesta	1707	
Millas reducidas	8	
Reducción de Combustible// CO2 aproximado	-56000/ 176792	
Estados involucrados	Perú, Chile, Argentina	
Observación	También se sugiere analizar el realineamiento de la UL550, VOR Calama a ASIA, en el descenso, afectaría a Zona Restringida San Juan de Marcona	
*De acuerdo a información disponible		

20	**Bs As/Bogotá**	
Ruta actual (FliteStar)	UB689, UA301, UL417, UW8,	Notas:
Distancia actual	2551	
*Número de vuelos	44	
*Tipo de aeronave más utilizada	A332, A342, B763, MD11	
Trayectoria propuesta	VOR ROSARIO/Posición MORRO	
Distancia de trayectoria propuesta	2549	
Millas reducidas	2	
Reducción de Combustible// CO2 aproximado	-2200/ 6945,4	
Estados involucrados	Argentina, Bolivia, Brasil, Colombia	
Observación		
*De acuerdo a información disponible		

21	**BS AS/GUAYAQUIL/Quito**	
Ruta actual (FliteStar)	UW5, UL550, UG436, UL780	Notas:
Distancia actual	2337	
*Número de vuelos	22	
*Tipo de aeronave más utilizada	B737	
Trayectoria propuesta	VOR ROSARIO/ Posición CANOA	Realineamiento
Distancia de trayectoria propuesta	2300	
Millas reducidas	37	
Reducción de Combustible// CO2 aproximado	-10000/ 31570	
Estados involucrados	Argentina, Chile, Perú, Ecuador	
Observación		
*De acuerdo a información disponible		

22	**SANTIAGO/BOGOTÁ**	
Ruta actual (FliteStar)	UG551, UL300	Notas:
Distancia actual	2339	
*Número de vuelos	140	
*Tipo de aeronave más utilizada	A332, A342, B763, MD11	
Trayectoria propuesta	VOR TABON/ Posición MORRO	
Distancia de trayectoria propuesta	2296	
Millas reducidas	43	
Reducción de Combustible// CO2 aproximado	-73800/ 232986,6	
Estados involucrados	Chile, Perú, Brasil, Colombia	
Observación		
*De acuerdo a información disponible		

23	SAO PAULO/ QUITO	
Ruta actual (FliteStar)	UM776, UA321, UB554, UZ8, UL201,	Notas:
Distancia actual	2377	
*Número de vuelos	70	Solo se registran vuelos de carga
*Tipo de aeronave más utilizada	B744, B763, MD11	
Trayectoria propuesta	QUITO/BAURÚ	Ruta Bidireccional
Distancia de trayectoria propuesta	2332	
Millas reducidas	45	
Reducción de Combustible// CO2 aproximado	-38600/ 121860,2	
Estados involucrados	Ecuador, Perú, Brasil, Bolivia	
Observación	Esta ruta es casi paralela con la ruta SAO PAULO /BAURU/ GUAYAQUIL Considerar eliminación o extensión de la UL776, QUITO/ IQUITOS	
*De acuerdo a información disponible		

24	LIMA/CARACAS	
Ruta actual (FliteStar)	UM414, UG427, TOSAL	Notas:
Distancia actual	1502	
*Número de vuelos	272	
*Tipo de aeronave más utilizada	A319, A320, A321, A343, B733, B762, B763	
Trayectoria propuesta	UM414/ AMBEX/ DAVEX/ UL216	Realineamiento de la UM414 o la creación de una nueva RNAV
Distancia de trayectoria propuesta	1486	
Millas reducidas	16	
Reducción de Combustible// CO2 aproximado	-53400/ 168583,8	
Estados involucrados	Perú, Colombia, Venezuela	
Observación	Implantar nueva ruta RNAV o realinear la um414, desde posición AMBEX a DAVEX	
*De acuerdo a información disponible		

25	ASUNCIÓN/LA PAZ	
Ruta actual (FliteStar)	UA320	Notas:
Distancia actual	805	
*Número de vuelos	8	
*Tipo de aeronave más utilizada	NI	
Trayectoria propuesta	VOR VAS/VOR LA PAZ	
Distancia de trayectoria propuesta	793	
Millas reducidas	12	
Reducción de Combustible// CO2 aproximado	-1600/ 5051,2	
Estados involucrados	Paraguay, Bolivia	
Observación		
*De acuerdo a información disponible		

26	ASUNCIÓN/SANTA CRUZ	
Ruta actual (FliteStar)	UA321	Notas:
Distancia actual	559	
*Número de vuelos	80	
*Tipo de aeronave más utilizada	A320, B732	
Trayectoria propuesta	VOR VAS/VOR VIR	
Distancia de trayectoria propuesta	553	
Millas reducidas	6	
Reducción de Combustible// CO2 aproximado	-6300/ 19889,1	
Estados involucrados		
Observación	Paraguay, Bolivia	
*De acuerdo a información disponible		

27	**LIMA/GUAYAQUIL**	
Ruta actual (FliteStar)	UG436, UL780,	Notas:
Distancia actual	626	
*Número de vuelos	204	
*Tipo de aeronave más utilizada	A319, B763, LJ45	
Trayectoria propuesta	CANOA/GALGO	
Distancia de trayectoria propuesta	613	
Millas reducidas	13	
Reducción de Combustible// CO2 aproximado	-32500/ 102602,5	
Estados involucrados	Perú, Ecuador	
Observación		
*De acuerdo a información disponible		

28	**LIMA/QUITO**	
Ruta actual (FliteStar)	UM674,	Notas:
Distancia actual	726	
*Número de vuelos	392	
*Tipo de aeronave más utilizada	A319, A320, B763, E145	
Trayectoria propuesta		
Distancia de trayectoria propuesta		
Millas reducidas		
Reducción de Combustible// CO2 aproximado	0/0	
Estados involucrados		
Observación	No hay necesidad de nueva ruta	
*De acuerdo a información disponible		

29	**LIMA/BOGOTÁ**	
Ruta actual (FliteStar)	UL305, W16	Notas:
Distancia actual	1036	
*Número de vuelos	662	
*Tipo de aeronave más utilizada	A319, A320, B732, B735, B752, B762, B763. MD11	
Trayectoria propuesta	AMBEX/MORRO	
Distancia de trayectoria propuesta	1014	
Millas reducidas	22	
Reducción de Combustible// CO2 aproximado	-178600/ 563840,2	
Estados involucrados		
Observación		
*De acuerdo a información disponible		

30	**BOGOTÁ/QUITO/GUAYAQUIL**	
Ruta actual (FliteStar)	UQ104, UA550, UG438	Notas:
Distancia actual	394	
*Número de vuelos	309	NILL
*Tipo de aeronave más utilizada	NILL	
Trayectoria propuesta	COLTA/MORRO	
Distancia de trayectoria propuesta	388	
Millas reducidas	6	
Reducción de Combustible// CO2 aproximado	-53400/ 168583,8	
Estados involucrados	Colombia, Ecuador	
Observación	Analizar la posibilidad de transformar la UA550 en RNAV	
*De acuerdo a información disponible		

31	**PANAMÁ/LIMA**	
Ruta actual (FliteStar)	UM674	Notas:
Distancia actual	1285	
*Número de vuelos		
*Tipo de aeronave más utilizada		
Trayectoria propuesta	Mantener ruta	
Distancia de trayectoria propuesta		
Millas reducidas		
Reducción de Combustible// CO2 aproximado	0/0	
Estados involucrados		
Observación	No sería necesario modificar la ruta actual	
*De acuerdo a información disponible		

32	**PANAMÁ/BOGOTÁ**	
Ruta actual (FliteStar)	UA317	Notas:
Distancia actual	410	
*Número de vuelos	NILL	
*Tipo de aeronave más utilizada	NILL	
Trayectoria propuesta	NILL	
Distancia de trayectoria propuesta		
Millas reducidas		
Reducción de Combustible// CO2 aproximado	0/0	
Estados involucrados		
Observación	Evaluar si será pertinente convertir la UA317 en RNAV, no habría ventaja en reducción de millas	
*De acuerdo a información disponible		

33	**PANAMÁ/CARACAS**	
Ruta actual (FliteStar)	UA553	Notas:
Distancia actual	750	
*Número de vuelos	229	
*Tipo de aeronave más utilizada	B722, B727, B732, B737, B738	
Trayectoria propuesta	MUBAR/PUERTO CABELLO (PBL)	
Distancia de trayectoria propuesta	745	
Millas reducidas	5	
Reducción de Combustible// CO2 aproximado	-26900/ 84923,3	
Estados involucrados		
Observación		
*De acuerdo a información disponible		

34	**PANAMÁ/SAO PAULO**	
Ruta actual (FliteStar)	UA317, UL201	Notas:
Distancia actual	2756	
*Número de vuelos	NILL	
*Tipo de aeronave más utilizada	NILL	
Trayectoria propuesta	Se sugiere analizar extender la UL201 de MITU a ITAGO	
Distancia de trayectoria propuesta	2742	
Millas reducidas	14	
Reducción de Combustible// CO2 aproximado	-37800/ 119334,6	
Estados involucrados		
Observación	Se sugiere analizar la Extensión de la UL201 de MITU hasta ITAGO, Reducción de millas no es significativa	
*De acuerdo a información disponible		

35	PANAMÁ/SANTIAGO	
Ruta actual (FliteStar)	UM674, UL302	Notas:
Distancia actual	2618	
*Número de vuelos	59	
*Tipo de aeronave más utilizada	B737, B738 ,B744	
Trayectoria propuesta	REPAL/TABON	
Distancia de trayectoria propuesta	2590	
Millas reducidas	28	
Reducción de Combustible// CO2 aproximado	-69400/ 219095,8	
Estados involucrados	Panamá, Colombia, Ecuador, Perú, Chile	
Observación		
*De acuerdo a información disponible		

36	PANAMÁ/BS AS	
Ruta actual (FliteStar)	UA558, UW8	Notas:
Distancia actual	2894	
*Número de vuelos	109	
*Tipo de aeronave más utilizada	B737, B738	
Trayectoria propuesta	REPAL/VOR PAR	
Distancia de trayectoria propuesta	2858	
Millas reducidas	36	
Reducción de Combustible// CO2 aproximado	-116500/ 367790,5	
Estados involucrados	Panamá, Colombia, Ecuador, Perú, Brasil, Bolivia, Argentina	
Observación	Esta ruta serviría también a para Montevideo, insertando un punto en la intersección con la UM400, a 47 NM sur de Ceres En una segunda opción analizar la UB555 (ver Mdeo/Lima) si se mantiene esta la ruta Panamá/Mdeo, puede interceptar Paraná y luego UB555 a Mdeo	
*De acuerdo a información disponible		

37	**SANTIAGO/CARACAS**	
Ruta actual (FliteStar)	UL216, UL309	Notas:
Distancia actual	2659	
*Número de vuelos	NILL	
*Tipo de aeronave más utilizada	B763	
Trayectoria propuesta	TABON/DAVEX	
Distancia de trayectoria propuesta	2640	
Millas reducidas	19	
Reducción de Combustible// CO2 aproximado	-3700/ 11680,9	
Estados involucrados	Chile, Bolivia, Brasil, Colombia, Venezuela	
Observación		
*De acuerdo a información disponible		

38	**CARACAS/QUITO**	
Ruta actual (FliteStar)	UA550	Notas:
Distancia actual	965	
*Número de vuelos	NILL	
*Tipo de aeronave más utilizada	NILL	
Trayectoria propuesta	MORRO/VOR PBL	
Distancia de trayectoria propuesta	950	
Millas reducidas	15	
Reducción de Combustible// CO2 aproximado	-30100/ 95025,7	
Estados involucrados	Venezuela, Colombia, Ecuador	
Observación	Analizar si se implementa, también se puede extender la nueva RNAV de Quito a Bogotá desde MORRO a VOR PBL (950 NM)	
*De acuerdo a información disponible		

39	**CARACAS/BOGOTÁ**	
Ruta actual (FliteStar)	UA550	Notas:
Distancia actual	571	
*Número de vuelos	594	
*Tipo de aeronave más utilizada	A319	
Trayectoria propuesta		
Distancia de trayectoria propuesta	571	
Millas reducidas		
Reducción de Combustible// CO2 aproximado	0/0	
Estados involucrados		
Observación	No hay ventaja operativa, considerar transformar UA550 en RNAV	
*De acuerdo a información disponible		

40	**BARRANQUILLA/MAIQUETÍA**	
Ruta actual (FliteStar)	UA552	Notas:
Distancia actual	465	
*Número de vuelos	36	
*Tipo de aeronave más utilizada	A330, A319	
Trayectoria propuesta	NILL	
Distancia de trayectoria propuesta		
Millas reducidas		
Reducción de Combustible// CO2 aproximado	0/0	
Estados involucrados	Colombia, Venezuela	
Observación	No será necesaria nueva ruta, analizar conversión a RNAV la UA552	
*De acuerdo a información disponible		

41	**CARACAS/BSAS**	
Ruta actual (FliteStar)	UL793	Notas:
Distancia actual	2784	
*Número de vuelos	86	
*Tipo de aeronave más utilizada	A319, B735	
Trayectoria propuesta	DAVEX/PAR	
Distancia de trayectoria propuesta	2637	
Millas reducidas		
Reducción de Combustible// CO2 aproximado	155000/ 489335	
Estados involucrados	Venezuela, Brasil, Bolivia, Paraguay, Argentina	
Observación	Actualmente no hay ruta directa	
*De acuerdo a información disponible		

42	**GUAYAQUIL/MADRID**	
Ruta actual (FliteStar)	UA550	Notas:
Distancia actual	1369NM	Hasta limite FIR Maiquetía/Piarco
*Número de vuelos	62	
*Tipo de aeronave más utilizada	B763	
Trayectoria propuesta	CARTE/DAREK	
Distancia de trayectoria propuesta	1345	
Millas reducidas	24	
Reducción de Combustible// CO2 aproximado		
Estados involucrados	Ecuador, Colombia, Venezuela,	
Observación	Actualmente no hay ruta directa	
*De acuerdo a información disponible		

43	**SAO PAULO/GUAYAQUIL**	
Ruta actual (FliteStar)	UM656, UM655, UB554, UA321, UM665,	Notas:
Distancia actual	2392	
*Número de vuelos	NILL	
*Tipo de aeronave más utilizada	NILL VOR BAURÚ/ CANOA	
Trayectoria propuesta	2329	
Distancia de trayectoria propuesta	63 Nnnn/Tons//nnnn/Tons.	
Millas reducidas	Brasil, Bolivia, Perú, Ecuador	
Reducción de Combustible// CO2 aproximado		
Estados involucrados		
Observación		
*De acuerdo a información disponible		

44	**SAO PAULO/GUAYAQUIL**	
Ruta actual (FliteStar)	UM656, UM655, UB554, UA321, UM665,	
Distancia actual	Notas:	
*Número de vuelos	2392	
*Tipo de aeronave más utilizada	NILL NILL	
Trayectoria propuesta	VOR BAURÚ/ PARDO/CANOA	
Distancia de trayectoria propuesta	Ruta alterna solicitada por LAN 2378	
Millas reducidas	14	
Reducción de Combustible// CO2 aproximado	Nnnn/Tons//nnnn/Tons.	
Estados involucrados	Brasil, Perú, Ecuador	
Observación	Esta trayectoria fue solicitada por LAN	
*De acuerdo a información disponible		

45	**SANTA CRUZ/SANTIAGO**	
Ruta actual (FliteStar)	UL322	
Distancia actual	Notas:	
*Número de vuelos	1041	
*Tipo de aeronave más utilizada	NILL	
Trayectoria propuesta	ASINO/IRESU	
Distancia de trayectoria propuesta	1036	
Millas reducidas	5	
Reducción de Combustible// CO2 aproximado	Nnnn/Tons//nnnn/Tons.	
Estados involucrados	Bolivia, Argentina, Chile	
Observación	No es necesario una ruta más directa, no hay vuelos, de requerirse se podría revisar la UL322 para realinearla de ASINO a IRESU	
*De acuerdo a información disponible		

46	**LA PAZ/SANTIAGO**	
Ruta actual (FliteStar)	UL309	
Distancia actual	Notas:	
*Número de vuelos	1026	
*Tipo de aeronave más utilizada	NILL	
Trayectoria propuesta	NILL	
Distancia de trayectoria propuesta		
Millas reducidas		
Reducción de Combustible// CO2 aproximado	Nnnn/Tons//nnnn/Tons.	
Estados involucrados	Bolivia, Argentina, Chile	
Observación	No es necesario la implantación de nueva ruta	
*De acuerdo a información disponible		

Gráfico de rutas RNAV propuestas para ser analizadas

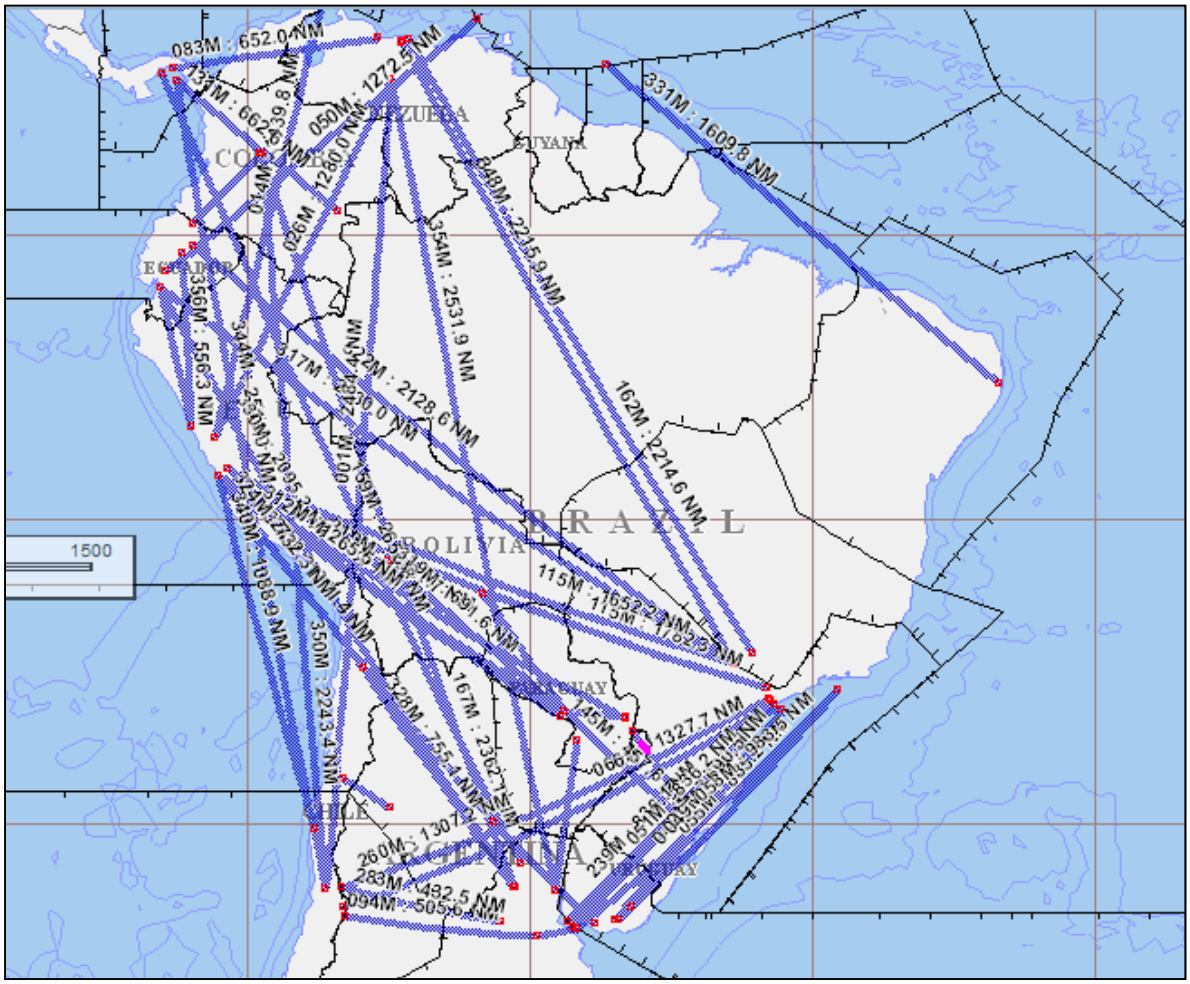


Gráfico de la subregión NORTE de Sudamérica

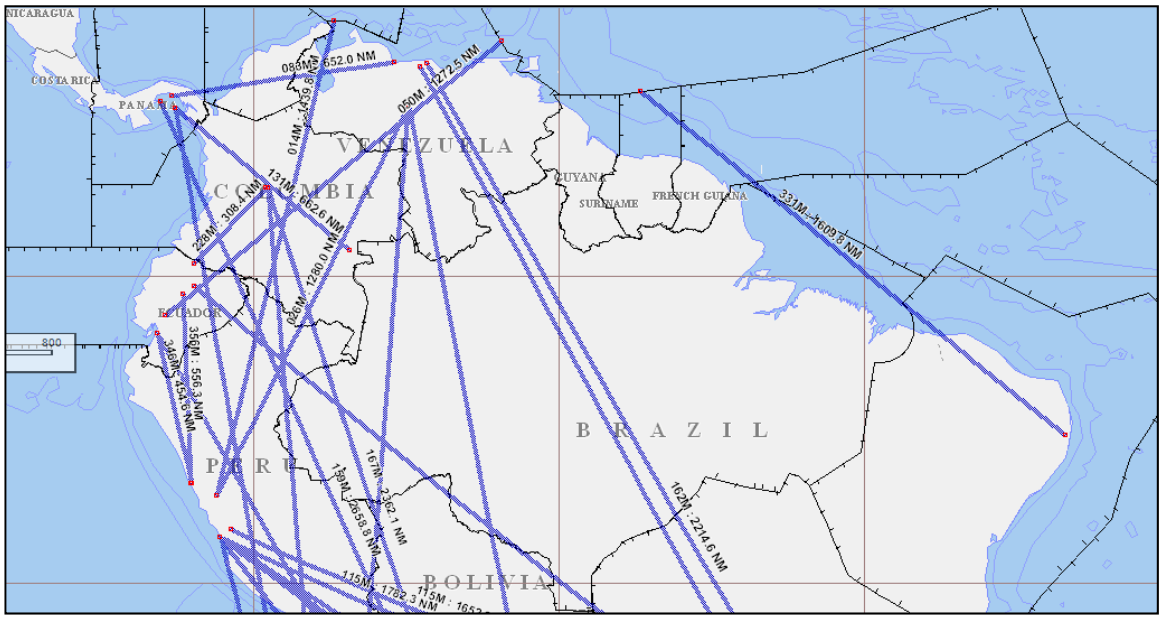
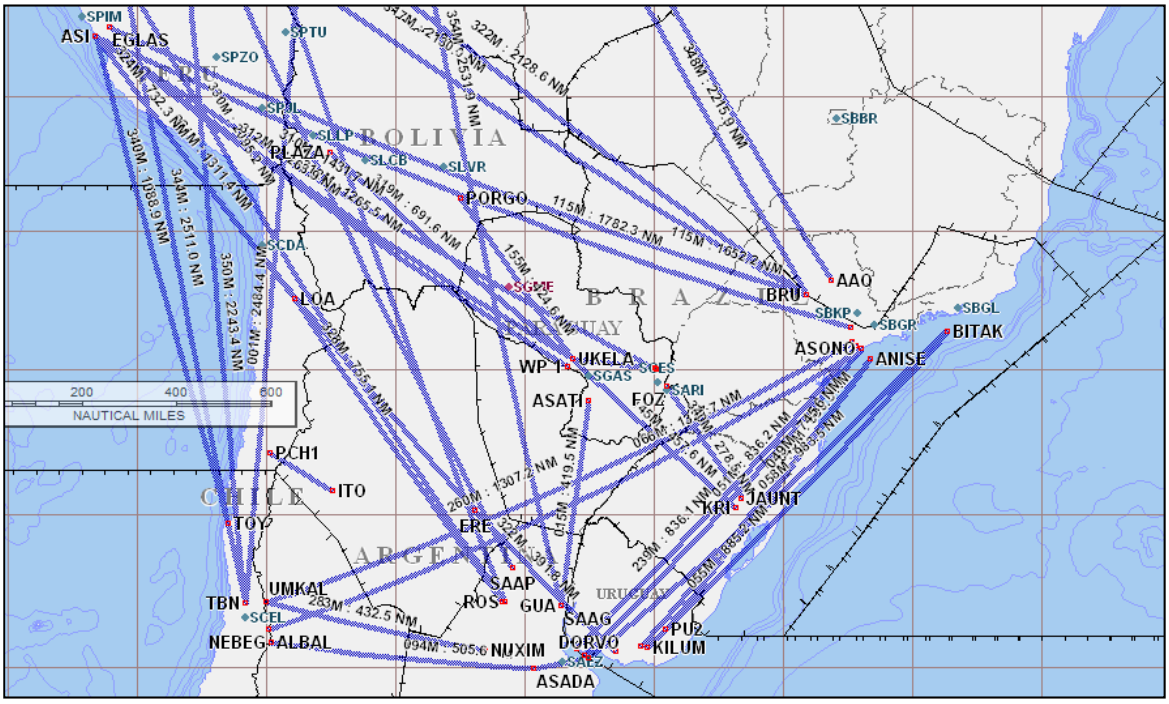


Gráfico de la subregión SUR de Sudamérica



Número	Scenario	Old Fuel Consumption in Kg	New Fuel Consumption in Kg	Savings in Kg	Savings(%)	CO2 savings kg
1	Buenos Aires/Sao Paulo	3675800	3426200	-249600	6.8	787987.2
2	Sao Paulo/Buenos Aires	3806800	3741300	-65500	1.7	206783.5
3	Rio /Buenos Aires	7644500	7595400	-49100	0.6	155008.7
4	Montevideo/Sao Paulo	1592500	1575600	-16900	1.1	53353.3
5	Montevideo/Rio de Janeiro	240200	239500	-700	0.3	2209.9
6	Sao Paulo/Santiago	5881300	5810800	-70500	1.2	222568.5
7	Santiago/Sao Paulo	6184500	6102900	-81600	1.3	257611.2
8	Buenos Aires/Santiago	6084500	6065400	-19100	0.3	60298.7
9	Santiago/Buenos Aires	6017600	5998500	-19100	0.3	60298.7
10	Lima/Sao Paulo	4735400	4715300	-20100	0.4	63455.7
11	Sao Paulo/Lima	4732900	4722900	-10000	0.2	31570
12	Sao Paulo/Bogota	6677800	6677800	0	0.0	0
13	Sao Paulo/Caracas	1446700	1434700	-12000	0.8	37884
14	Asunción/Buenos Aires	2878900	2829800	-49100	1.7	155008.7
15	Lima/Montevideo	1385800	1360700	-25100	1.8	79240.7
16	Lima/Asunción	1054400	1039900	-14500	1.4	45776.5
17	Lima/Foz Iguacu	1180600	1161600	-19000	1.6	59983
18	Lima/Santiago	5712600	5695500	-17100	0.3	53984.7
19	Lima/Buenos Aires	11985800	11929800	-56000	0.5	176792
20	Buenos Aires/Bogotá	2752500	2750300	-2200	0.1	6945.4
21	BsAires/Guayaquil-Quito	630400	620400	-10000	1.6	31570
22	Santiago/Bogotá	4015000	3941200	-73800	1.8	232986.6
23	Sao Paulo/Quito	2040100	2001500	-38600	1.9	121860.2
24	Lima/Caracas	5009200	4955800	-53400	1.1	168583.8
25	Asunción/La Paz	105400	103800	-1600	1.5	5051.2
26	Asunción/Santa Cruz	585600	579300	-6300	1.1	19889.1
27	Lima/Guayaquil	1565800	1533300	-32500	2.1	102602.5
28	Lima/Quito	3489400	3489400	0	0.0	0
29	Lima/Bogotá	8409000	8230400	-178600	2.1	563840.2
30	Bogotá/Quito-Guayaquil	3502400	3449000	-53400	1.5	168583.8
31	Panamá/Lima	6459700	6459700	0	0.0	0
32	Panamá/Bogotá	3428400	3428400	0	0.0	0
33	Panamá/Caracas	4046100	4019200	-26900	0.7	84923.3
34	Panama/Sao Paulo	7434100	7396300	-37800	0.5	119334.6
35	Panamá/Santiago	6484100	6414700	-69400	1.1	219095.8
36	Panamá/Buenos Aires	9367600	9251100	-116500	1.2	367790.5
37	Santiago/Caracas	521600	517900	-3700	0.7	11680.9
38	Caracas/Quito	1940400	1910300	-30100	1.6	95025.7
39	Caracas/Bogotá	4158600	4158600	0	0.0	0
40	Caracas/Barranquilla	205200	205200	0	0.0	0
41	Caracas/Buenos Aires	2935600	2780600	-155000	5.3	489335
42	Guayaquil/Madrid /DAREK	1000300	929500	-70800	7.1	223515.6
	Total	**155522500**	**154082000**	**-1440500**	**1.536**	**4547658.5**

APPENDIX D TO APPENDIX A

Proposal for amendment to the CAR/SAM ANP - Volume I - Basic
Serial N° SAM XX/X - ATM

a) **Plan**: CAR/SAM Air Navigation Plan – Volume I - Basic
(Document 8733)

b) **Proposal for amendment:**

1. Add, as described, the following routes: **Identify routes to be incorporated into the plan**.
(Cf – Doc. 8733, Volume I, Basic, Part V – Appendix A - Table ATS-1)

ESPACIO AEREO INFERIOR / LOWER AIRSPACE UM XX1		
Punto significativo Significant Point	**Latitud Latitude**	**Longitud Longitude**

2. Realign, as described the following routes, **insert routes to be realigned**

ESPACIO AEREO INFERIOR / LOWER AIRSPACE G443		
Punto significativo Significant Point	**Latitud Latitude**	**Longitud Longitude**

3. Delete, as described below, the requirement of routes **insert routes to be deleted from the plan**
(Cf – Doc. 8733, Volume I, Basic, Part V – Appendix A - Table ATS-1)

ESPACIO AEREO SUPERIOR / UPPER AIRSPACE UA552		
Punto significativo Significant Point	**Latitud Latitude**)	**Longitud Longitude**

c) **Originated by**: Insert the name of the States and International Organizations originating the amendment

d) **Reasons of the originator for the amendment**:

Insert comments and reasons that led to amend the air navigation plan.

e) **Proposed date of implementation**:

As of at least to AIRAC cycles after the proposal for amendment has been approved by ICAO Council, in accordance to specific implementation programmes that establish particular and in a coordinate manner, States, Territories and International Organizations

f) **Proposal circulated to the following States/Territories/International Organizations**:

Insert name of States, Territories and International Organizations to which the proposal for amendment is being circulated.

g) **Secretariat comments**:

Insert Secretariat comments regarding the amendment.

APPENDIX B

Project RLA 06/901
Assistance for the implementation of a regional ATM system based on the ATM operational concept and the corresponding technological support for communications, navigation, and surveillance (CNS)

GUIDANCE FOR THE IMPLEMENTATION OF FLEXIBLE USE OF AIRSPACE (FUA) CONCEPT IN THE SOUTH AMERICAN REGION

First Edition
April 2012

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Guidance for the Implementation of Flexible Use of Airspace (Fua) Concept in the South American Region

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PREFACE

The Guidance for the Implementation of the Flexible Use of Airspace (FUA) Concept at ICAO South American Region (Guidance FUA / SAM) is published by the ICAO's South American Regional Office on behalf of ICAO's South American Regional Implementation Group (SAMIG). It considers the different aspects that States should take into account for the coordination and cooperation between civil and military air traffic, recognizing that the airspace is a common resource of civil and military aviation, that allows to achieve safety, consistency and efficiency of civil aviation and to meet military air traffic requirements through the implementation of dynamic airspace.

The Regional Office, on behalf of SAMIG shall publish revised versions of the SAM/FUA Guidance needed to keep a duly updated document.

You can request copies of the SAM/FUA Guidance at:

ICAO's SAM OFFICE LIMA, PERU

E-mail	:	mail@lima.icao.int
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Contact e-mail	:	***cfigueiredo@lima.icao.int***
		rlarca@lima.icao.int

This edition (*Version 0.0)* includes all other revisions and amendments as of April 2011. Subsequent amendments and corrigenda shall appear in the Amendment and Corrigenda Record Table, pursuant to the procedure set forth below.

The publishing of amendments and corrigenda is announced regularly through correspondence with the States and International Organisations, and at the ICAO's Regional South American Office website, mandatory reference for those who use this publication. Blank cells are meant to facilitate note-taking.

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS			
Num.	Effective date	Date recorded	Recorded by

CORRIGENDA			
Num.	Effective date	Date recorded	Recorded by

ACRONYMS AND ABBREVIATIONS

ACC	Area Control Centre
AD	Aerodrome
ADIZ	Air Defence Identification Zone
AIP	Aeronautical Information Publication
AMC	Airspace Management Cell (AMC)
ANSP	Air Navigation Service Provider
ASM	Airspace Management
ATC	Air Traffic Control
ATFM	Air Traffic Flow Management
ATM	Air Traffic Management
ATS	Air Traffic Services
AUP	Airspace Utilization Plan
CADF	Centralised Airspace Data Function
CBA	Cross Border Area
CBP	Customs and Border Protection
CDM	Collaborative Decision Making
CDR	Conditional Route
CFMU	Central Flow Management Unit
CNS/ATM	Communication, Navigation and Surveillance/Air Traffic Management
CRAM	Conditional Route Availability Message
ENR	En route
EUROCONTROL	European Organisation for the Safety of Air Navigation
FAA	Federal Aviation Administration
FAUP	Forecast Airspace Utilization Plan
FIR	Flight Information Region
FMU/FMP	Flow Management Unit/Flow Management Position
FUA	Flexible Use of Airspace
FUUP	Forecast Update of the Utilization Plan
GAT	General Air Traffic
GEN	General
GNSS	Global Navigation Satellite System
GPI	Global Plan Initiatives
LOA	Letter of Agreement
MOA	Military Operation Area
MOU	Memorandum of Agreement
MSL	Mean Sea Level
NextGen	Next Generation
NOTAM	Notice to Airmen
PANS	Procedures for Air Navigation Services
PBN	Performance-Based Navigation
PIRG	Planning and Implementation Regional Group
PFF	Performance Framework Form
RPA	Remotely Piloted Aircraft
RPAS	Remotely Piloted Aircraft System
RPS	Remotely Piloted Station
SAR	Search and Rescue
SARPS	Standards and Recommended Practices

SAM-PBIP	Performance-Based Implementation Plan for SAM Region
SESAR	Single European Sky ATM Research
SMS	Safety Management Systems
SUA	Special Use Airspace
SUPPS	Regional Supplementary Procedures
TRA	Temporary Reserved Areas
TSA	Temporary Segregated Areas
UAS	Unmanned Aircraft System
UIR	Upper Flight Information Region

APPLICABLE DEFINITIONS IN THIS SAM/FUA GUIDANCE

Remotely Piloted Aircraft. Aircraft whose pilot is not on board.

Temporary Reserved Area (TRA). Airspace temporarily reserved and allocated for the specific use of a particular user during a determined period of time, through which other flights may pass with permission from air traffic control (ATC).

Temporary Segregated Area (TSA). Airspace temporarily reserved and allocated for the exclusive use of a specific user during a determined period of time, through which no other flights may pass.

Cross Border Area (CBA). Reserved or segregated airspace established for specific operational requirements on international borders.

Air traffic service unit. A generic term meaning variously, air traffic control unit, flight information centre or air traffic services reporting office.

Segregated Airspace. Airspace of specific dimensions allocated for the exclusive use of a user or users.

Remote Pilot Station (RPS). A station from which the pilot remotely operates the flight of an unmanned aircraft.

Air Traffic Flow Management (ATFM). A service established with the objective of contributing to a safe, orderly and expeditious flow of air traffic by ensuring that AT capacity is utilised to the maximum extent possible, and that the traffic volume is compatible with the capacities declared by the appropriate ATS authority.

Airspace Management (ASM). Process whereby airspace options are selected and applied in order to meet the airspace users' needs.

Air Traffic Management (ATM). The dynamic, integrated management of air traffic and airspace (including air traffic services, airspace management and air traffic flow management) under safe, cost-effective, and efficient conditions by providing facilities and seamless services in collaboration with all stakeholders and incorporating ground and on-board features.

Global Plan Initiatives (GPI). They are designed to support the planning and implementation of performance objectives in ICAO Regions.

Performance-Based Navigation (PBN). Performance-based area navigation requirements applicable to aircraft operating along an ATS route, on an instrument approach procedure, or in a designated airspace.

Standards and Recommended Practices (SARPS). The Council adopts standards and recommended practices pursuant to Articles 54, 37 and 90 of the Convention on International Civil Aviation and are defined as follows:

Standard. A standard is a specification of physical characteristics, configuration, material, performance, personnel or procedure, whose uniform application is recognized as necessary for the safety or regularity of international air navigation which contracting States shall comply pursuant to the Convention; in case

compliance is not possible, notification to the Council is mandatory, as set forth in Article 38 of the Convention.

Recommended practice. A recommended practice is a specification of physical characteristics, configuration, material, performance, personnel or procedure, whose uniform application is deemed convenient for safety, regularity or efficiency of international air navigation which contracting States shall comply pursuant to the Convention.

Remote pilot. Person remotely operating the flight controls of a remotely piloted aircraft during flight.

Procedures for Air Navigation Services (PANS). Procedures adopted by the Council, including general operational procedures that are not considered mature enough to be adopted as international standards and recommended practices, or more permanent texts that are inappropriate or too detailed to be included in an Annex.

Regional Supplementary Procedures (SUPPS). Operational procedures that supplement the Annexes and PANS developed largely through ICAO's regional air navigation meetings to meet the needs of a specific ICAO region. It addresses issues related to safety and consistency of international air navigation. They are published in a single document for all regions. ICAO's Regional Supplementary Procedures (SUPPS) are part of the air navigation plan prepared by the Regional Air Navigation Conferences (ANC) to meet those needs in certain areas not covered by global provisions.
They complement the requirement exhibition for facilities and services contained in the air navigation plan publications.

Collaborative Decision-Making (CDM). A process whereby all ATM decisions, except for ATC tactical decisions that are based on the exchange of all relevant information for transit operations between civilian and military parties.

Flight Information Region (FIR). An airspace of defined dimensions within which flight information service and alerting service are provided.

Conditional Route (CDR). A non-permanent ATS route or part of it that can be planned and used under special conditions.

ATM security. Contribution of the ATM system to the protection of civil aviation, safety, and national defence, law enforcement and protection of the ATM system against security threats and vulnerabilities.

Air Traffic Services (ATS). A generic term meaning variously, flight information, alerting, air traffic advisory, air traffic control services (area control, approach control or aerodrome control services).

Customs and Border Protection Services (CBP). Protect the State by preventing illegal entry of persons and goods while facilitating legitimate travelling and trade.

Unmanned Aircraft System (UAS). Aircraft and its associated elements operated without a pilot on board.

Remotely Piloted Aircraft System (RPAS). Configurable set of elements consisting of a remotely piloted aircraft, its remote pilot station(s), the mandatory command and control links, and any other system element required at some point during the flight operation.

Air Traffic Management. A system that provides ATM through the integration of human resources, information technology, and facilities, in collaboration with the support of ground-, air-, and/or space-based communications, navigation and surveillance.

Global Navigation Satellite System (GNSS). A worldwide position and time determination system that includes one or more satellite constellations, aircraft receivers and system integrity monitoring, augmented as necessary to support the required navigation performance for the intended operation.

Flexible Use of Airspace (FUA). Concept of airspace management based on the principle that airspace should not be designated as exclusively military or civilian, but as a continuous space that meets the requirements of all users to the extent possible.

Danger area. An airspace of defined dimensions within which activities dangerous to the flight of aircraft may exist at specified times.

Prohibited area. An airspace of defined dimensions, above the land areas or territorial waters of a State, within which the flight of aircraft is prohibited.

Restricted area. An airspace of defined dimensions, above the land areas or territorial waters of a State, within which the flight of aircraft is restricted in accordance with certain specified conditions.

1 Preamble

1.1 Objective

1.1.1 The Guidance for the Implementation of the Flexible Use of Airspace in ICAO's South American Region (SAM/FUA Guidance) has been designed to help ensure that the States of the Region have the applicable regional procedures, in harmonic fashion.

1.1.2 The development of the guidance has been taken into consideration the recommendations of the International Civil Aviation Organization in this regard, the Global Air Navigation Plan (Doc 9850) and the guidelines set forth in the Performance-Based Implementation Plan for the SAM Region (SAM-PBIP) which states that the optimal, balanced and equitable use of airspace by civil and military users, shall be facilitated through both strategic coordination and dynamic interaction, thus allowing the implementation of optimal flight paths, reducing operating costs of airspace users while protecting the environment.

1.2 Scope

1.2.1 The SAM/FUA Guidance has been developed to be used by SAM States in the FIRs under their jurisdiction, taking into account the operational improvements and airspace optimization initiatives in the short and medium term, and particularly in accordance with ATS route network optimization in the SAM Region.

2 Global background

2.1 Annex 2 - *Rules of the Air*, contains rules concerning flight and aircraft manoeuvring within the scope of Article 12 of the Convention, and provisions for coordination with military authorities for reasons of integrity and territorial sovereignty of a State, whereas Annex 11 - *Air Traffic Services*, contains provisions concerning the need to coordinate with military authorities or units, mainly to the extent that State aircraft activities may affect civilian operations and *vice versa*.

2.2 In addition, the *Procedures for Air Navigation Services - Air Traffic Management* (PANS-ATM, Doc. 4444) contain procedures applicable to other in-flight contingencies, such as lost or unidentified aircraft, that require coordination with military authorities, and describe procedures for the implementation of special military operations.

2.3 Information on coordination requirements between military units and air traffic services can also be found in the *Manual concerning safety measures relating to military activities potentially hazardous to civil aircraft operations* (Doc 9554) and in the *Air traffic services planning manual* (Doc 9426).

2.4 Likewise, the *Global Air Navigation Plan* (Doc 9750) proposes 23 initiatives (GPI) oriented to the implementation of the ATM operational concept. GPI 1 refers precisely to the *"Flexible use of airspace"* (**APPENDIX B**

Note: In light of the new aviation system block upgrade (ASBU) methodology fostered by ICAO, the Global Air Navigation Plan shall be updated and the current global plan initiatives (GPI) shall be inserted in the different modules of each block proposed in this methodology.

2.5 The *ICAO Global Air Traffic Management Operational Concept* (Doc 9854) describes the services required to operate the global air traffic system in the near future and beyond, and lists the requirements to provide more flexibility for users, maximize efficiency, and increase system capacity, while improving safety. Integral parts of these elements are interoperability and military system operations.

2.6 *Appendix O of Assembly Resolution A 37-15: Consolidated statement of continuing ICAO policies and associated practices related specifically to air navigation* (**APPENDIX B**

2.7 The resolution states, among other things, that the joint use of airspace and some facilities by civil and military aviation will be provided in such a way so as to attain safety, regularity and efficiency of civil aviation and to meet the requirements of military air traffic, and promotes the dissemination of best practices and the adoption of follow-up action building upon the success of the *Global air traffic management forum on civil-military cooperation* (2009) with the support of the civil and military stakeholders.

2.8 The Forum recognized that most ICAO Regions had made great progress in airspace management and military-civilian cooperation; however, it recognized the need to further improve cooperation between authorities and with air navigation service suppliers. It was suggested that, in order to promote cooperation, military representatives should participate at ICAO meetings, seminars and other relevant events as part of State delegations.

2.9 Upon summarizing the results of the Forum, the following was stated:

a) Peace and stability are essential conditions for social and economic development;

b) Trust and mutual understanding are key requirements for collaboration between civil and military authorities;

c) The safety, security and efficiency are common civil and military values;

d) For civil aviation, efficiency means greater capacity, less delays, and a reduction in costs, fuel consumption and emissions;

e) For military aviation, efficiency means mission efficacy (in times of peace and crisis) and realistic training, together with greater capacity, less delays and a reduction in costs, fuel consumption and emissions;

f) Cooperation and coordination require communication;

g) Civil-military cooperation is essential at national, regional and international level;

h) Airspace is a continuum and a limited common resource for all civil and military users;

i) Better knowledge and application of flexible use of airspace principles are a good basis for civil-military coordination of ATM;

j) Civil-military interaction is essential to optimize the safe and efficient use of airspace for all users, and the global aviation community must properly resolve gaps;

k) The integration of UAS is a challenge as well as an opportunity for the growth of the aviation system;

l) Civil-military cooperation and coordination are essential, both in times of peace and crisis;

m) A global civil-military approach to security and incident management is needed, taking into account positive experiences that can help improve the system;

n) Greater efforts are needed, not only within the context of flexible use of airspace, but also in terms of standards and compatible procedures and global interoperability of ATM systems; and

o) Good collaboration requires communication, education, good relationships and trust.

2.10 Finally, in response to the agreements reached at the 2009 Global air traffic management forum on civil-military cooperation, ICAO and civil and military experts developed Circular 330-AN/189, which contains examples of good practices in civil-military cooperation and recognizes that growing civil air traffic and military air missions would benefit significantly from a more flexible use of airspace, and recommends and provides guidance on best practices in civil-military cooperation that could be adopted by States.

3 Regional background

3.1 Civil-military cooperation and coordination in the South American Region have traditionally been based on a dialogue between civilian and military authorities with the view to making better use of airspace for both and improving cooperation for the use and integration, where possible, of their respective air traffic control facilities.

3.2 The States of the South American Region, taking into account the provisions of the Global Air Navigation Plan, the ATM operational concept and the conclusions of the Caribbean and South American Regional Planning and Implementation Group (GREPECAS), developed the Performance-Based Air Navigation System Implementation Plan for the SAM Region (SAM-PBIP), a plan that was approved for regional implementation through *Conclusion RAAC/12-1 Performance-Based Air Navigation System Implementation Plan for the SAM Region (SAM PBIP)* of the Twelfth Meeting of Directors of Civil Aviation (RAAC/12) of the SAM Region held in October 2011 (**APPENDIX C**

3.3 The main gap identified in the current system is the lack of a policy and procedures for the flexible use of airspace, which hampers airspace design and management by not allowing the application of an optimal airspace structure and the use of optimum flight paths. The limitations that have been identified include the existence of permanently reserved airspace, primarily for military purposes, and inadequate airspace planning, which prevents direct flights between airports of origin - destination and/or city pairs.

3.4 The period considered by the SAM PB ANIP runs from 2012 to 2018 and the expected evolution is based on the Global Plan Initiatives that apply to en-route operations, TMA operations, and air operations in general.

3.5 ATM planning has been based on seven global aspects, for which the respective performance framework forms (PFF) have been developed. One of these aspects is the Flexible Use of Airspace, which has been identified as (PFF SAM/ATM 04 **APPENDIX D**). This activity identified the following benefits for the ATM community, which should be attained through operational and technical activities aligned with this performance objective:

a) Improved civil/military coordination and cooperation strengthens airspace safety;

b) It allows for a more efficient ATS route structure, reducing miles flown and fuel consumption and, consequently, CO^2 emissions into the atmosphere;

c) It increases airspace capacity; and

d) Increased availability of reserved airspace at times when there is no activity by the users of such airspace.

Note: In light of the new aviation system block upgrade (ASBU) methodology fostered by ICAO, the SAM Region will have to update the SAM PB ANIP, as well as the PFFs that will be replaced by the air navigation report forms (ANRF).

3.6 As part of regional activities and in order to improve civil/military coordination and cooperation and in response to Assembly Resolution A 37-15, ICAO organized the Seminar on Civil/Military Coordination and

Cooperation and flexible use of airspace in the NAM, CAR and SAM Regions, which was held on 16-19 August 2011, in Lima, Peru.

3.7 This seminar was attended by civil and military authorities, that had the opportunity to exchange views, receive valuable information on activities being carried out worldwide. As a result of the discussions, they issued a series of recommendations that should be implemented by the States and ICAO as appropriate:

a) Support to the holding of an event as a follow-up to the Global Civil-Military Cooperation Forum (2009);

b) The seminar requested ICAO to coordinate the drafting of regional guidelines on civil-military cooperation for the CAR/SAM regions;

c) The seminar recommended to make arrangements for civil-military work at regional level;

d) States are encouraged to apply the Flexible Use of Airspace (FUA) principles (Annex 11 - Air Traffic Services, Procedures for Air Navigation Services - Air Traffic Management (PANS-ATM, Doc 4444) and Circular 330-An/189 Civil-Military Cooperation in Air Traffic Management);

e) ICAO is requested to develop guidance material on the Flexible Use of Airspace (FUA);

f) The participation of military authorities at ICAO meetings is recommended (Resolution A37-15, Appendix O: Coordination and Cooperation of Civil and Military Air Traffic);

g) The ICAO NACC and SAM Regional Offices are requested to organize a workshop on ATM crisis management; and

h) CAR/SAM States, whenever possible, should establish a liaison office for civil-military coordination within their Civil Aviation Department in order to facilitate coordination between civil and military sectors.

4 Rationale

4.1 As world economies grow, demand for air travel multiplies; thus, airspace and airport capacity must increase to meet this demand. Traditional methods of increasing capacity have reached the end of their possibilities, so new, improved methods and concepts will be needed to maximize existing capacity and increase it where possible.

4.2 In the context of the ATM Operational Concept, airspace management (ASM) is the process whereby options for the use of airspace are selected and applied to meet user needs. The objective of ASM is to achieve a more efficient use of airspace, taking into account actual needs and, whenever possible, to avoid permanent segregation of airspace.

4.3 There are several and sometimes conflicting interests regarding the use of airspace, so ASM is a complex exercise. Additionally, there are also activities that require the reservation of a certain volume of airspace for its exclusive or special use (SUA) for defined periods of time due to the characteristics of its flight profile, the importance of its operations or the risks involved by the operations to be performed in said space and the need to separate them effectively and safely from other types of aeronautical activities.

4.4 Airspace management should be based on the following principles and strategies:

a) all available airspace should be managed in a flexible manner;

b) airspace management processes should incorporate dynamic flight paths and provide optimal operational solutions;

c) when conditions require segregation, based on different types of operations and/or aircraft, the size, shape and time zones of said airspace should be determined to minimize impact on operations;

d) the use of airspace should be coordinated and monitored to meet the different requirements of all users and minimize operational limitations;

e) Airspace reservation should be planned in advance, making dynamic changes where possible. The system must also be able to meet unexpected last minute requirements; and

f) The complexity of operations may limit the degree of flexibility.

g) According to the guidelines established in the SAM PBIP, the optimal, balanced, and equitable use of airspace by civil and military users shall be facilitated through both strategic coordination and dynamic interaction, allowing for the establishment of optimal flight paths while reducing operating costs for airspace users.

4.5 The flexible use of airspace must also include airspace over high seas within the jurisdiction of the FIR, considered without detriment to the rights and obligations of Member States under the Convention on International Civil Aviation (Chicago Convention) of 7 December 1944 and its Annexes.

5 Basic guiding principles of civil-military coordination and cooperation

5.1 The concept of flexible use of space should basically consider the following guiding principles:

a) coordination and cooperation between civil and military authorities shall be organized at strategic, pre-tactical and tactical management level by establishing letters of operational agreement and/or special procedures for a given activity, aimed at increasing airspace safety and capacity and improving the efficiency and flexibility of air operations;

b) consistency among airspace management, air traffic management, air traffic flow and management, and air traffic service functions must be established and maintained to ensure efficient planning, distribution and use by all users at the three airspace management levels (strategic, tactical and pre-tactical);

c) airspace reservation for exclusive or specific use of certain user categories shall be temporarily applied only during limited periods of time depending on actual use and it shall be disregarded as the activity that motivated it ceases to be, and it shall follow the procedures set forth in ICAO documents and Annexes as well as those prescribed in the Letters of Operational Agreement and/or special procedures.

d) air traffic service units and users will make the best possible use of available airspace,

e) coordination and collaborative decision-making by ATS, ATFM units, and effective application of the flexible use of airspace concept must be consistent and permanent during the strategic, pre-tactical and tactical phases of airspace management; and

f) Adequate resources should be allocated for an effective implementation of the flexible use of airspace concept, taking into account both civil and military needs.

6 General guidelines for the implementation of the FUA concept

6.1 SAM States should establish policies on the use of temporarily or permanently reserved airspace in order to avoid the adoption of airspace restrictions as much as possible.

6.2 The process of implementing the Flexible Use of Airspace should start with an assessment of restricted, prohibited and danger airspace that affect or could affect air traffic. To this end, this paper provides an initial analysis from a regional perspective.

6.3 If they have not done it yet, States should implement the Civil/Military Coordination and Cooperation Committees or a similar body, aimed at assessing the various of airspace management and air traffic control issues that somehow affect civil and military activities.

6.4 The relevant aviation authority should encourage the development of the necessary letters of operational agreement between ATS and military units or other users for the dynamic and flexible use of airspace, avoiding restrictions on the use of airspace, thus meeting the needs of all users.

6.5 In cases where airspace restriction is inevitable, the letters of agreement should specify that the activation of airspace reservation should not extend beyond the time required. This will require the development of paths that permit the dynamic re-routing of aircraft to avoid such airspaces.

6.6 The aforementioned paths should be published in the AIP in order to alert users of the need to consider said possible deviations in flight planning.

6.7 Appropriate measures should be taken to improve the effectiveness of air traffic flow management in order to assist existing operational units ensure efficient flight operations.

6.8 The implementation of the FUA requires convincing the users of reserved airspace, mainly the military authorities of the States involved, that their needs will be met, regardless of the application of airspace restrictions. Thus, seminars/meetings with the authorities will be essential to demonstrate the importance of optimized use of airspace.

7 National policies for the implementation of the FUA concept

7.1 FUA is an airspace management concept based on the principle that airspace should not be designated as exclusively military or civilian, but as a continuum that meets the maximum possible requirements of all users.

7.2 The effective and harmonized implementation of the flexible use of airspace in the volume of airspace under consideration requires precise civil-military coordination rules and dynamics, taking into account the needs of all users and the nature of their various activities, avoiding permanent reservation inasmuch as possible and optimizing its flexible use, without detriment to the privileges and defense responsibilities of Member States.

7.3 In order to accomplish that stated above, the effectiveness of civil-military coordination procedures must be based on rules and procedures for the efficient use of airspace by all users, which should be reflected in the Letters of Operational Agreement between the military authorities and Air Traffic Services (ATS), and on some basic guiding principles.

7.4 The objective of establishing common policies for SAM States responds to the need to ensure a uniform and harmonized implementation of the provisions on the adoption of the flexible use of airspace concept.

7.5 The States should, if they have not done it yet, insert the text on the application of the flexible use of airspace concept in their national legislation. The purpose of regulating FUA is to support the concept of an operating airspace that is increasingly integrated into the framework of the common transport policy and to establish common design, planning and management procedures to ensure an efficient and safe air traffic management.

7.6 The legislation should reinforce the need for coordination and cooperation between civil and military authorities, especially for the allocation and efficient use of airspace for military purposes, including the criteria and principles that should govern said allocation and use, particularly its opening to civilian flights.

7.7 National legislation should include a safeguard clause enabling States to suspend the application of the standard if so required for national military purposes. **APPENDIX E** contains a sample of a national standard, as reference.

8 Analysis of the use and management of Restricted, Prohibited, Danger and Special use areas

8.1 In order to achieve a comprehensive ATS route network that serves the interests of all users, including commercial, military, general, sports aviation, and unmanned aircraft systems (UAS), it will be necessary to analyze all restricted, prohibited and danger areas that have been implemented in each State in order to apply the flexible use of airspace concept.

8.2 This work is not intended to eliminate or arbitrarily reduce the special use airspace assigned, but rather, through the implementation of collaborative decision making (CDM), find the best options that may satisfy all airspace users and ensure that the needs identified are met, regardless of the application of airspace restrictions.

8.3 The States should analyze the different cases in which, for safety reasons, it would be necessary to establish procedures or letters of agreement to avoid tactical airspace management, as this implies the adoption of real-time decisions by the control service. While tactical management should be included in every action plan, this should be the tool of last resort, as it is not possible to apply the most appropriate solution when time is scarce and data to consider are varied.

8.4 Note was taken of the existence of permanently reserved airspace, primarily for military purposes, in a way that could prevent proper airspace planning, not allowing direct flights between airports of origin - destination and/or city pairs, as well as operations at inappropriate flight levels and/or speeds that prevented aircraft from maintaining optimum flight profiles, and major ground and/or en-route system delays.

8.5 SAM States should establish policies on the use of temporarily or permanently reserved airspace, to avoid, as much as possible, the adoption of airspace restrictions, and to consider and integrate the unmanned aircraft systems (UAS) into its air navigation system, which adds a new component to the aviation system that should start being considered.

8.6 There is a high percentage of special use airspace that should be analyzed within the context of civil/military cooperation in each particular State. There are 124 published prohibited areas, 421 restricted areas, 41 danger areas and 83 special areas in the Region, including volcanic areas and other special areas for aerial sports and recreational activities (**APPENDIX F**).

8.7 In order to proceed to assess the Restricted, Prohibited, Hazardous and Special use areas, the States could use as a model the form in **APPENDIX G**.

8.8 The purpose of the form is to identify the type of area or special use airspace, the lateral dimension in square kilometers and the vertical dimension with upper and lower limits, the period of use, the nature of the activity, the body or entity responsible for activating the area, the impact on the current design of airspace and finally, if planning could be potentially affected by the area.

9 Establishment of the Civil/Military Coordination and Cooperation Committee

9.1 ICAO Standards and Recommended Practices (SARPs), the recommendations and conclusions of different events on Civil/Military coordination and cooperation that have been approved for regional application aim at mutual cooperation between civil and military authorities; however, not every State has a formal civil/military coordination and cooperation committee.

9.2 In order to ensure FUA implementation, each State should establish a civil/military coordination and cooperation committee or similar body to assess opportunities for implementing Special Use Airspace (SUA). It is noteworthy that success of this initiative depends on the committee having the power to ensure the use of airspace by all users according to their specific needs, while avoiding, inasmuch as possible, the permanent reservation of airspace that would lead to a limited use of airspace when not being used.

9.3 These civil/military coordination and cooperation committees ensure coordination of decisions on civil and military airspace management and air traffic control issues at all levels, and are essential for the implementation of an ATS route network that meets the current requirements of airspace users.

9.4 Civil/military coordination and cooperation committees should include representatives of civil and military aviation and other airspace users as needed.

9.5 For these civil/military coordination and cooperation committees to be established, civil aviation administrations must propose terms of reference or objectives for that committee and then agree on a work program based on those terms of reference. States may consider the following aspects, *inter alia*:

a) Achieve civil-military coordination and optimum joint use of airspace with the highest degree of safety, regularity and efficiency of international civil air traffic;

b) Develop national policies regarding flexible use of airspace (FUA);

c) Review and provide the necessary links between civil ATS units and the relevant air defense military units to ensure day-to-day integration or segregation of civil/military air traffic operating in the same airspace segments;

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

e) Consider the special use of airspace in order to validate the actual use and reach agreement on the joint use of airspace;

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

g) Develop and implement security measures related to military activities potentially hazardous for civil aircraft operations;

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

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

   i) Pay due attention to the need of not hampering the safe and economical operation of civil aircraft operations;
   ii) Provide appropriate intermediate areas within the designated area, based on the time and size of the activities to be conducted;
   iii) Use of standard ICAO terminology to define the areas;

j) Analyse and determine at regular intervals if it is still necessary to keep prohibited, restricted and danger zones;

k) Develop appropriate arrangements and procedures for establishing a temporary reservation of airspace, and

l) Other aspects that civil and military authorities consider should be analyzed in the context of the civil/military coordination and cooperation committee or body they deem most appropriate.

9.6 Based on the flexible use of airspace achieved through the civil/military coordination and cooperation committee, airspace planners in the States should develop proposals for the implementation, realignment or elimination of routes that would significantly influence the development of the ATS route network, taking into account the possibility of offering better flight profile to users and a possible reduction in airspace complexity.

9.7 The establishment of a civil/military cooperation and coordination committee to manage the application of the flexible use of airspace concept is absolutely necessary and it must be managed taking into account all users, applying guiding principles aligned with the flexible use of airspace concept.

10 Letters of Operational Agreement between civil and military ATS units

10.1 As provided in the PANS/ATM (Doc 4444), the Letters of Operational Agreement between civil and military ATS units may define agreements and procedures for the flexible use of airspace, and should specify, *inter alia*, the following points:

a) The horizontal and vertical boundaries of the airspace concerned;
b) The classification of airspace available for use by civil air traffic;
c) The units or authorities responsible for airspace handover;
d) Airspace handover conditions to the ATC unit concerned;
e) Airspace handover conditions from the ATC unit concerned;
f) Airspace availability periods;
g) Any limitations on the use of the airspace in question; and
h) Any other relevant procedures or information.

10.2 A sample Letter of Operational Agreement between civil and military authorities is shown in **APPENDIX H**

11 Airspace management within the scope of FUA

11.1 The flexible use of airspace is an airspace management concept based on the principle of accommodating all the users of that space to the extent possible, considering effective communication, cooperation and the necessary coordination to ensure the security, safety, efficiency and environmental sustainability.

11.2 This concept includes strategic (Level 1), pre-tactical (Level 2), and tactical (Level 3) self-management functions that are independent but closely linked, and that are to be carried out in a coordinated manner to ensure an efficient use of airspace.

11.3 When several aviation activities with different requirements take place in the same airspace, coordination must be aimed at the safe conduct of flights and the optimum use of available airspace.

11.4 The systematic application of this concept should be taken into account for the optimization of the route network, especially for the definition of scenarios with non-permanent or conditional routes.

11.5 In addition, some SAR activities, exercises or military operations may require coordination and cooperation with more than one State at a given moment, and the establishment of civil/military cooperation and coordination committees in every State acquires greater important in these cases.

11.6 The support of traffic flow management (ATFM) units to air operations is crucial to provide the necessary conditions for mitigating possible adverse effects on civil aviation.

11.7 **Strategic Management of Airspace (Level 1)**

11.7.1 To ensure the strategic management of airspace within the scope of FUA, civil and military air traffic service providers should perform at least the following functions:

a) Ensure the implementation of flexible use of airspace at the strategic, tactical and pre-tactical levels;

b) Review the needs of users on a regular basis;

c) Review and approve the activities that require reservation or restriction of airspace;

d) Define temporary airspace structures and procedures to offer multiple reservation options and routes;

e) Establish criteria and procedures for the creation and use of adjustable lateral and vertical boundaries of the airspace needed to accept variations in flight paths and short-term changes in flights;

f) Assess national airspace structures and the route network in order to plan flexible airspace structures and procedures;

g) Determine the conditions under which the responsibility for separating civil and military flights will rest on civil and military ATS units or on the controlling military units;

h) Establish and provide users with airspace structures in close cooperation and coordination with neighboring member States when the corresponding airspace structures have major repercussions on cross-border traffic or on the boundaries of flight information regions, with a view to ensuring an optimum use of airspace for all users;

i) Establish mechanisms for consultation between persons or agencies and all interested parties and organizations, in order to properly meet user needs;

j) Include the corresponding air traffic flow management (ATFM) units in the planning and implementation of the FUA concept from the beginning;

k) Develop, assess and periodically review the procedures, coordination and performance of operations within the flexible use of airspace concept;

l) Establish mechanisms for storing data about the requests, allocation and actual use of airspace for subsequent analysis and planning of activities;

m) Make sure that the areas designated for training, recreation, ATC sectors, route network, arrival and departure procedures are implemented and published on a timely basis, in coordination with the requirements of all airspace users, taking into account ICAO strategic objectives.

11.8 Pre-tactical Management of Airspace (Level 2)

11.8.1 The civil and military units should ensure the introduction of appropriate support systems, preferably automated, that will allow timely communication of airspace availability to all users involved, special airspace management units, if any, air traffic service providers, and all the corresponding parties and organizations by airspace managers.

11.8.2 Military control units and air traffic service units should inform each other of any change in the planned activation of airspace in a timely and efficient manner, and inform all the users involved about the actual status of airspace.

11.9 Tactical Management of Airspace (Level 3)

11.9.1 Tactical ASM should take place at the level of ATS and military control units. Safety procedures for coordination and cooperation between these agencies should be established to allow direct, real-time communication of relevant information in order to resolve specific traffic situations in the same volume of airspace and in adjacent airspaces to where civil and military controllers provide services.

11.9.2 Information should be available to civil and military controllers and military control units through a quick exchange of flight data, including aircraft position and flight intention, particularly when required for security reasons.

11.9.3 When civil and military controllers are providing services in the same airspace, there should be highly reliable direct communications between civil and military ATS units to resolve specific traffic situations. If minimum levels of safety are required, ATC civil units and military control units shall exchange flight data, including aircraft position and flight intention.

Post-operation analysis (Level 4)

11.9.4 The SAM region deemed it advisable to add a level of post-operation analysis to this process in order to assess the operations performed, communications, and possible safety gaps that may have been identified so as to ensure continuous improvement of civil-military coordination and cooperation.

11.9.5 A report registry can be created at this level to help the different stakeholders and the training section to focus on activities that will improve operations.

12 Flexible and adjustable airspace structures and procedures

12.1 Circular 330 -AN 189, in addressing this issue, states that the FUA concept may be based on the potential offered by flexible and adjustable structures and procedures, which are especially suitable for the assignment and temporary use of conditional routes, temporary reserved areas (TRA), temporary segregated areas (TSA) and cross border areas (CBA).

12.2 The FUA concept thus complements organizing airspace with a series of flexible structures as defined below:

12.2.1 Conditional Route (CDR): Non-permanent ATS route (see Figure 1) or portion thereof that can be planned and used under specified conditions. According to their foreseen availability and flight planning possibilities, and the level of activity expected from the associated TSA, conditional routes can be divided into the following categories:

a) Category one (CDR1): permanently schedulable;

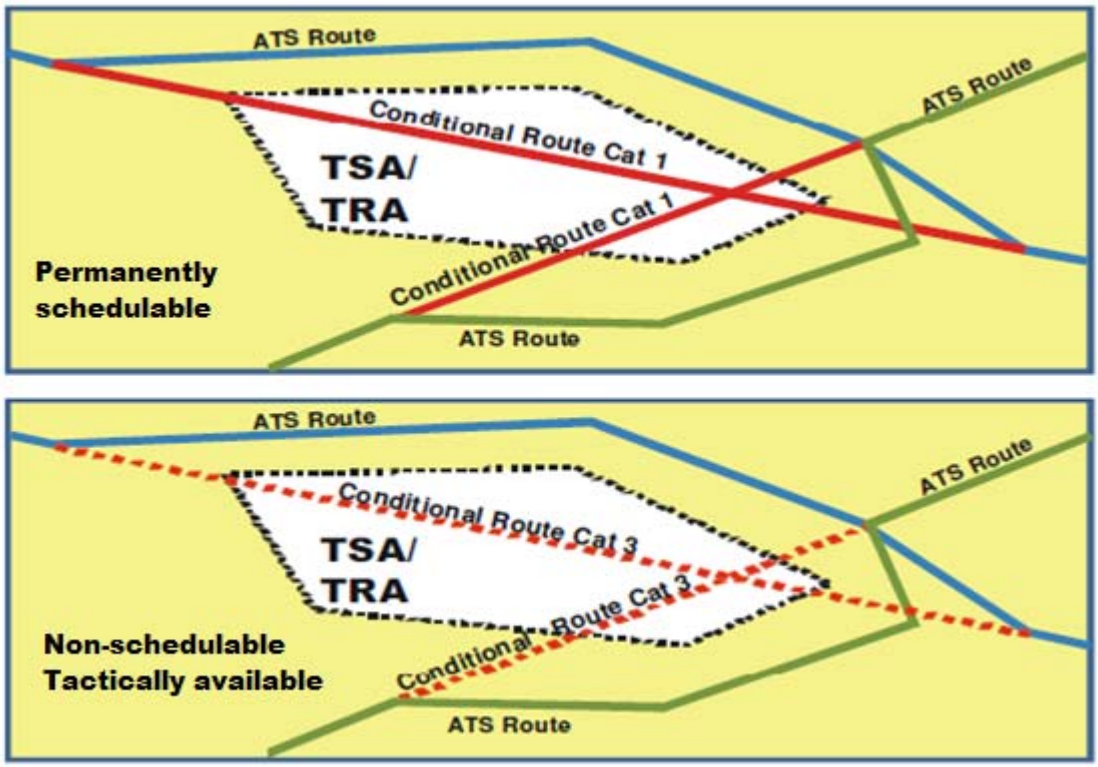
b) Category two (CDR2): non-permanently schedulable; and

c) Category three (CDR3): not schedulable.

12.2.2 Temporary reserved area (TRA): A TRA (see Figure 1) is airspace temporarily reserved and allocated for the exclusive use of a user during a determined a period of time, through which other flights can operate with ATC permission.

12.2.3 Temporary segregated area (TSA): A TSA (see Figure 1) is airspace temporarily reserved and allocated for the exclusive use of a specific user during a determined period of time, through which no other flight traffic is allowed.

12.2.4 Cross border area (CBA): A CBA (see Figure 2) is a reserved or segregated airspace established on international borders to meet specific operational requirements. CBAs are established for purposes of instruction and military training and for other flights operating on both sides of a border. Since CBAs are not bound to national borders, they can be defined so as to benefit both civil and military aviation. CBAs in combination with conditional routes crossing them improve airspace structure in border areas and help improve the ATS route network. Before establishing CBAs, political, legal, technical, and operational agreements between the States concerned are required. Formal agreements for the establishment and use of CBAs should take into account sovereignty, defense, law, operations, the environment, and search and rescue.



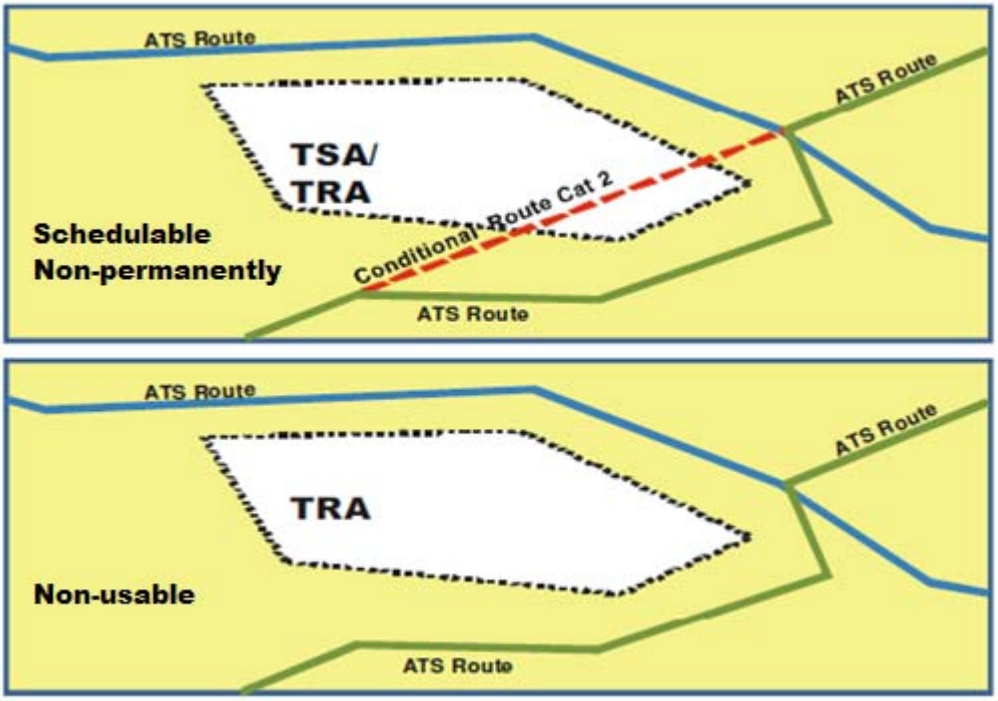


Figure 1

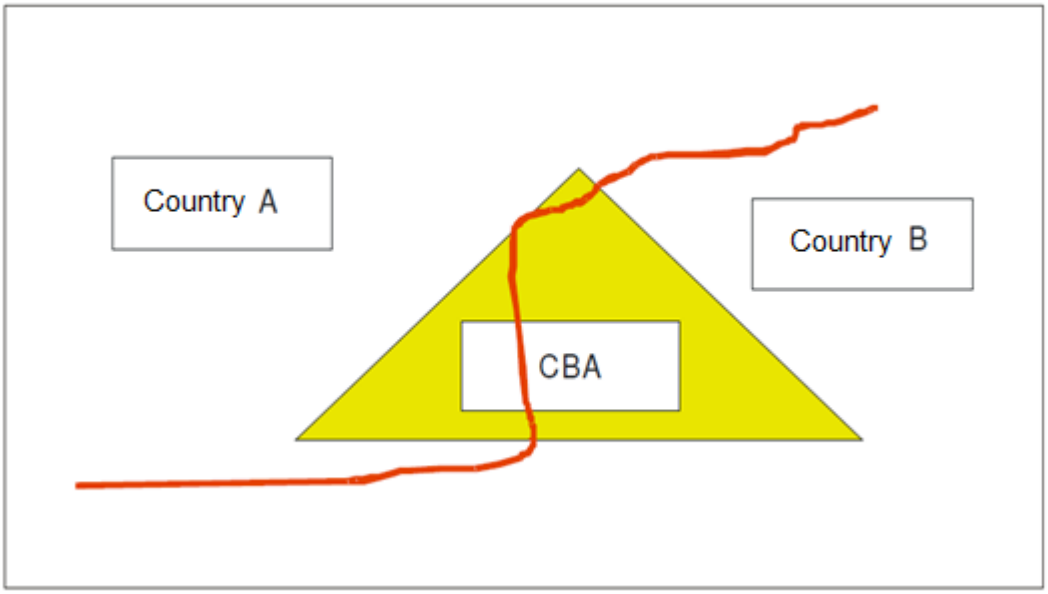


Figure 2

12.2.5 Airspace management cell (AMC): A national joint civil/military unit responsible for managing on a day-to-day basis or upon request (pre-tactical phase) the allocation of airspace in accordance with requests from users (ACC, FMU / FMP, management units and other military zones and accredited agencies).

12.2.6 There is no experience in the South American Region with this type of conditional routes. Therefore, the establishment of modes of employment of non-permanent routes should be assessed in light of experiences elsewhere in the world. The Region should take action on this issue and establish criteria for defining the scenarios where non-permanent routes are to be applied.

12.2.7 It would be interesting for States to begin implementation by adopting some procedures used in other Regions. To this end, **APPENDIX I** contains concepts and procedures of the European Region.

13 Safety assessment

13.1 During the safety management process and before introducing any change in the implementation of FUA, it is important to conduct a safety assessment that includes hazard identification and risk assessment and mitigation in accordance with SMS procedures.

13.2 In a stage following the operational phase, an assessment will be made of issues identified, inspection and audit findings, SMS analyses, which may produce important information that should be used for continuous airspace optimization.

13.3 Therefore, the reports of joint actions in the flexible use of airspace as well as the analysis by a multidisciplinary group of experts are of great importance for the analysis of lessons learned, with a view to improving the procedures and rules applied to optimize safety and the flexible use of airspace.

14 Information management

14.1 Good information management is critical to the successful implementation of the FUA concept; thus the critical importance of timely distribution and accuracy of information transmitted to civil and military controllers concerning airspace status and specific air traffic conditions that directly affect safety, efficacy and efficiency of operations.

14.2 In relation to the above, timely access to updated information on airspace status is vital for all parties wishing to use the available airspace structures for preparing or modifying their flight plan.

14.3 In accordance with the provisions of the AIS Manual (Doc 8126), the AIP is divided into three parts, Part 1 - General (GEN), consisting of administrative and explanatory information that is not of such importance or significance that requires the issuance of a NOTAM, Part 2 - En route (ENR), containing information on the airspace and its utilization, and Part 3 - Aerodromes (AD), with information on aerodromes / heliports and their utilization.

14.4 In light of the above, all aspects of the flexible use of airspace should be included in Part 2 ENR.

14.5 Section 3 - ATS routes, in Part 2, ENR includes detailed lists of all ATS routes established within the territory covered by the AIP, whether they are part of ICAO regional air navigation agreements or used only for domestic traffic. Where applicable, a description of the routes or portions thereof where special procedures are required to eliminate or reduce the need for interceptions should be included. The relevant special procedures should also be included. Particularly in ENR 3.5, *Other routes*, a description of other specifically designated routes that are mandatory within specified areas is required.

14.6 In order to comply with the provisions of Doc 8126, conditional routes (CDR) will be published in ENR 3.5.

14.7 Furthermore, in accordance with the AIS Manual, Section ENR 5.2 *Military exercise and training areas and air defense identification zone* (ADIZ), there shall be a description, as appropriate, of the areas established for the military exercise and training taking place at regular intervals and of the ADIZ zone.

14.8 In view of the above, this Section will contain temporary segregated areas, with the geographical coordinates of boundaries, upper and lower limits, and the system and the means established to announce the initiation of activities, together with all relevant information on civil flights.

15 Seminars/meetings

15.1 State administrations, working with air navigation service providers (ANSPs) and with the military authorities, should take steps to create the political will, establish institutional arrangements, bringing together civil and military authorities nationwide, set goals, apply practical and operational measures, and finally, make the necessary changes to make all this possible.

15.2 The seminars, meetings, and other similar events will raise awareness among all stakeholders about the need to achieve these common objectives for the benefit of international civil aviation.

16 Collaborative Decision Making (CDM)

16.1 Decision-making (CDM) is the process whereby all ATM decisions, except for ATC tactical decisions, are based on the exchange of all relevant information for traffic operations between civil and military parties. States and service providers should adopt CDM principles, with the participation of military planners as a means to support ASM.

16.2 CDM brings together airlines, civil aviation and military authorities and airports, in an effort to improve ATM through the exchange of information and data, and improved automated decision-support tools.

16.3 The collaboration philosophy may become an aviation standard. CDM allows the exchange of information and facilitates decision-making processes to ensure that stakeholders receive timely and accurate information essential to plan their operations, whether civil or military.

16.4 For example, accurate estimates of arrival or departure times can improve the processing of aircraft, apron services, the allocation of stands and exit gates, ATC and ATFM. The involvement of military airspace users and planners in national or regional airspace planning ensures proper planning, both in time and size, which not only benefits military aviation but also minimizes conflicts with civil traffic.

16.5 With decisions based on the sharing of accurate information, CDM improves predictability in case of unforeseen problems or events. If properly implemented, CDM also leads to an optimum use of airspace, with benefits for all participants in the system.

16.6 For CDM implementation, the use of the Manual on collaborative decision making that was approved for regional implementation by the SAMIG/6 Meeting, Conclusion SAMIG/6/7 is suggested. The *CDM Manual for South America (SAM)* is posted at the following address of the ICAO South American Regional Office:
http://www.lima.icao.int/eDocuments/ATM/ATFM/4CDM%20Manual%20Spa.pdf

16.7 The CDM Manual describes methods and procedures to manage the Collaborative Decision Making process to be applied in the SAM Region. The purpose of this paper has been to provide assistance to SAM States in reaching a common understanding of the collaborative Decision Making (CDM) process with a view to the application of this methodology, which seeks the participation of all parties involved in ATFM in the implementation of equitable measures among ATM system users.

17 Action Plan for the implementation of the FUA concept

17.1 As a reference and to assist SAM States in the implementation of the FUA concept, a model action plan has been developed, as shown in **APPENDIX J**. This action plan has been developed taking into account ICAO indications as well as the activities of the PFF SAM/ATM 04 of the SAM PB ANIP.

17.2 The action plan identifies some of the tasks to be executed by SAM States, starting with the establishment of a policy for developing standards related to the FUA concept, if it has not been done yet. It also encourages States to establish a high-level national civil-military coordination body, to conduct a uniform and collaborative national airspace planning process, taking into account the needs of all users as well as national security, defense and police requirements. It also invites States to establish rules and procedures of communication, negotiation and setting of priorities for civil-military coordination.

17.3 Furthermore, it encourages States to start assessing their special use airspace as soon as possible to verify the suitability and possibility of an early dynamic use or modification of such airspace for its use by civil aviation. It also defines some tasks for the establishment and publication of procedures for activities that require airspace reservation and restriction, and for the establishment of frame agreements or letters of operational agreement, as applicable, between civil and military authorities to facilitate coordination.

17.4 Finally, it includes tasks related to the need of establishing a system for periodically reviewing airspace requirements, organization and management, and conducting a timely risk assessment by applying the SMS methodology to ensure that changes in the system maintain and/or improve the agreed safety levels.

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APPENDICES

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APPENDIX A

GPI - Flexible Use of Airspace

Scope: Optimized, balanced and equitable use of airspace by civil and military users, facilitated by strategic coordination and dynamic interaction

Components associated to the operational concept: AOM and AUO

Strategy description

Airspace use could be optimized through dynamic interaction of civil and military air traffic, including real-time coordination among civil and military controllers. This needs system support, operational procedures, and appropriate information on the position and intentions of civil traffic.

The flexible use of airspace concept (FUA) is based on the principle that the airspace should not be designated as purely civil or military, but, instead, it should be a continuous space in which the requirements of all users are met inasmuch as possible. The flexible use of airspace should translate into the elimination of extended temporarily or permanently restricted airspace segments or special use airspace.

In those cases in which it is still necessary to reserve airspace for specific individual uses, thus blocking airspace of a given size, an attempt should be done to do it on a temporary basis. Airspace should be cleared immediately after the operations that gave rise to such restrictions have been completed.

Greater benefits associated to FUA implementation can be achieved through cooperation among States, which may require regional and sub-regional agreements since reserved airspace is frequently established along critical flight paths along national borders.

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APPENDIX B

Assembly Resolution A 37-15

A37-15: Consolidated statement of continuing ICAO policies and associated practices related specifically to air navigation

Whereas in Resolution A15-9 the Assembly resolved to adopt in each session for which a Technical Commission is established a consolidated statement of continuing policies related specifically to air navigation up to date as at the end of that session;

Whereas a statement of continuing policies and associated practices related specifically to air navigation as they existed at the end of the 36th Session of the Assembly was adopted by the Assembly in Resolution A36-131, Appendices A to W inclusive;

Whereas the Assembly has reviewed proposals by the Council for the amendment of the statement of continuing policies and associated practices in Resolution A36-13, Appendices A to W inclusive, and has amended the statement to reflect the decisions taken during the 37th Session; and

Whereas the statement of continuing policies in Resolution A36-13 is hereby superseded:

The Assembly:

1. *Resolves* that:

    a) the Appendices attached to this resolution constitute the consolidated statement of continuing air navigation policies and associated practices of the Organization as they exist at the close of the 37th Session of the Assembly; and

    b) the practices associated with the individual policies in the appendices constitute guidance intended to facilitate and ensure implementation of the respective policies; and

2. *Declares* that this resolution supersedes Resolution A36-13 with its Appendices A to W inclusive.

APPENDIX O TO ASSEMBLY RESOLUTION A 37-15

Coordination and cooperation of civil and military air traffic

Whereas the airspace is a resource common to both civil and military aviation and given that many air navigation facilities and services are provided and used by both civil and military aviation;

Whereas the Preamble of the *Convention on International Civil Aviation* stipulates that signatories thereto had “agreed on certain principles and arrangements in order that international civil aviation may be developed in a safe and orderly manner and that international air transport services may be established on the basis of equality of opportunity and operated soundly and economically”;

Whereas Article 3 a) of the Convention states that "the Convention shall be applicable only to civil aircraft, and shall not be applicable to state aircraft" and Article 3 d) requires that "contracting States undertake, when issuing regulations for their state aircraft, that they will have due regard for the safety of navigation of civil aircraft";

Recognizing that growing civil air traffic and mission-oriented military air traffic would benefit greatly from a more flexible use of airspace used for military purposes and that satisfactory solutions to the problem of cooperative access to airspace have not evolved in all areas;

Whereas the flexible use of airspace by both civil and military air traffic may be regarded as the ultimate goal, improvement in civil/military coordination and cooperation, offers an immediate approach towards more effective airspace management; and

Recalling that the ICAO Global ATM Operational Concept states that all airspace should be a usable resource, any restriction on the use of any particular volume of airspace should be considered transitory, and all airspace should be managed flexibly:

The Assembly resolves that:

1. the common use by civil and military aviation of airspace and of certain facilities and services shall be arranged so as to ensure the safety, regularity and efficiency of civil aviation as well as to ensure the requirements of military air traffic are met;

2. the regulations and procedures established by Contracting States to govern the operation of their state aircraft over the high seas shall ensure that these operations do not compromise the safety, regularity and efficiency of international civil air traffic and that, to the extent practicable, these operations comply with the rules of the air in Annex 2;

3. the Secretary General shall provide guidance on best practices for civil/military coordination and cooperation;

4. Contracting States may include, when appropriate, representatives of military authorities in their delegations to ICAO meetings; and

5. ICAO serves as an international forum that plays a role in facilitating improved civil/military cooperation, collaboration and the sharing of best practices, and to provide the necessary follow-up activities that build on the success of the Global Air Traffic Management Forum on Civil/Military Cooperation (2009) with the support of civil/military partners.

Associated practices

1. Contracting States should as necessary initiate or improve the coordination and cooperation between their civil and military air traffic services to implement the policy in Resolving Clause 1 above.

2. When establishing the regulations and procedures mentioned in Resolving Clause 2, the State concerned should coordinate the matter with all States responsible for the provision of air traffic services over the high seas in the area in question.

3. The Council should ensure that the matter of civil and military coordination and cooperation in the use of airspace is included, when appropriate, in the agenda of divisional and regional meetings, in accordance with Resolving Clauses 3, 4 and 5 above.

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APPENDIX C

Conclusion RAAC/12-1 Performance-based Air Navigation Implementation Plan for the SAM Region (SAM PBIP)

The States of the ICAO South American Region and the international organisations involved:

a) approve the Performance-based Air Navigation Implementation Plan for the SAM Region shown in **Appendix A** (*i.e. RAAC 12 Report*), for its implementation at regional level;

b) encourage those States that have not done so to prepare their national performance-based air navigation plan in accordance with the guidelines contained in the cited implementation plan; and

c) request the ICAO South American Regional Office to review Project RLA 06/901 in order to align it with the performance objectives established in the cited implementation plan.

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APPENDIX D

REGIONAL PERFORMANCE OBJECTIVE: SAM/ATM 04 FLEXIBLE USE OF AIRSPACE	
Benefits	
Safety	• Enhanced civil/military coordination and cooperation reinforces airspace safety
Environment protection and sustainable development of air transport	• Permits a more efficient ATS route structure, reducing miles flown and fuel consumption, and thus CO2 emissions into the atmosphere. • Increases airspace capacity. • Increased availability of reserved airspace when there is no activity by airspace users.
Metrics	
• Percentage of implemented civil/military coordination committees or similar organisations • Number of implemented civil/military cooperation and coordination agreements • Reduction in the number of permanently reserved airspaces	
Strategy ***2012 – 2018***	

OC ATM COMPO-NENTS	TASKS	START-END	RESPONSIBLE PARTY	STATUS
AOM AUO CM	a) prepare guidance material on civil/military coordination and cooperation for the establishment of policies, procedures and national regulations	(*) - 2012	Regional Project States	In progress
	b) evaluate the number and size of reserved airspaces	(*) – 2012	States	In progress
	c) establish civil/military coordination committees or similar organisations	(*) - 2012	States	In progress
	d) make arrangements for permanent linkage and close cooperation between civil ATS units and the appropriate military units, as well as with reserved airspace users	(*) - 2012	States	In progress
	e) establish, when required by ANSPs, procedures for coordinating temporary reserved airspace through the issuance of NOTAMs or specific real-time reservation activation/deactivation procedures	(*) – 2013	States	Valid
	f) develop a strategy and work programme for the implementation of flexible use of airspace, through a stage-based approach, starting with a more dynamic sharing of reserved airspace	2012 - 2018	Regional Project States	Valid
	g) track progress during implementation	(*) – 2013	GREPECAS	In progress
Link to GPI	GPI/1: Flexible use of airspace; GPI/18: Aeronautical information. (*) Indicates that this task was started before the the scheduled date.			

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APPENDIX E

Example of national regulation for the implementation of flexible use of airspace

Preamble

Appendix O to Assembly Resolution A 37-15: *Consolidated statement of continuing ICAO policies and associated practices related specifically to air navigation* refers specifically to coordination and cooperation between civil and military air traffic. Hence, it recognizes that airspace is a common resource for civil aviation and military aviation and that a large number of air navigation facilities are available to, and used by, both civil and military aviation.

This resolution also states, among other aspects, that the shared use of airspace and certain facilities by both civil and military aviation will be arranged in such a way as to achieve safety, regularity and efficiency of civil aviation and meet the requirements of military air traffic.

Taking into account the organization of military aspects under its responsibility, XXX (*Name of State*) shall guarantee the sound application of the flexible use of airspace concept described by ICAO within the airspace under its responsibility to facilitate airspace and air traffic management.

Objective

The purpose of this standard is to define guidelines for the application of the flexible use of airspace (FUA) concept within Flight Information Regions (FIR) XXXX, **XXXX** (*name of FIR(s)*) to facilitate its use and harmonize its application within the context of airspace management (ASM) and air traffic management (ATM).

Background

The flexible use of airspace is a concept developed by the International Civil Aviation Organization (ICAO) that is being developed by the SAM Implementation Group (SAMIG) of the ICAO South American Region. FUA is an airspace management concept based on the principle that airspace should not be used exclusively for military or civil purposes but rather should be a continuous space in which the requirements of users are met as far as possible.

Likewise, it is recognized that the shared use of airspace and certain facilities by both civil and military aviation will be such that it will be possible to achieve safety, regularity and efficiency of civil aviation and meet the requirements of military air traffic, and encourages the dissemination of best practices.

Scope

These regulations establish a number of parameters to ensure better cooperation and coordination among civil and military entities responsible for managing the airspace under the responsibility of **XXX** (*name of State*).

FUA Principles

An FUA concept should be based on the following principles:

Coordination among civil and military authorities shall be articulated at a strategic, pre-tactical and tactical level in order to increase safety and airspace capacity, and improve the efficiency of air operations.

Consistency should be established and maintained between ASM, air traffic flow management (ATFM), and ATS at the three ASM levels.

Airspace reservation should be temporary, applied only during limited periods of time, and based on actual use of the airspace.

Wherever possible, the FUA concept should be applied beyond national borders or flight information region (FIR) boundaries.

Strategic Airspace Management

In order to ensure full application of the FUA concept at the ASM strategic level, it is necessary to establish airspace structures, develop coordination and airspace management procedures, and establish cross-border coordination and separation standards for civil and military flights.

Strategic airspace management is known as FUA Level 1.

Pre-tactical Airspace Management

An ASM entity should be established for the allocation of airspace in accordance with the conditions and procedures agreed at the strategic level.

In XXX (*State*), civil and military authorities are jointly responsible for airspace management. Therefore, the ASM entity shall be a joint civil-military unit. If necessary, the unit can also be established by two or more States. XXX (*name of State*) shall provide entities with the appropriate ASM support systems to ensure a timely and efficient process.

Pre-tactical airspace management is known as FUA Level 2.

Tactical Airspace Management

Tactical ASM should be carried out at the level of ATS units and military control units. Through special coordination and communication procedures, airspace data can be exchanged on a timely basis so that the airspace allocated to the pre-tactical level may be activated, deactivated or reassigned in real time. Updated airspace status should be communicated to all affected users.

When civil and military controllers provide services in the same airspace, direct and highly reliable communications should be available between civil and military ATS units in order to resolve specific traffic issues. If minimum safety levels are required, civil ATCs and military control units can exchange flight data, including aircraft position and flight intention data.

Tactical airspace management is known as FUA Level 3.

Post-operation analysis (Level 4)

At this level, an assessment shall be made of the mechanisms and processes used for management, creating a registry of reports on aspects that could be improved and lessons learned. This analysis will help to improve FUA processes and management, and material will be available to train all parties with a view to improving operations.

Safety Assessment

Within the safety management processes, and before introducing any change to the implementation of flexible use of airspace, it is necessary to perform a safety assessment for hazard identification and risk analysis and mitigation in accordance with SMS procedures.

Temporary Suspension

When the application of the FUA concept generates major operational difficulties, XXX (*Name of State*) may temporarily suspend such application provided the ATM community is immediately informed thereof.

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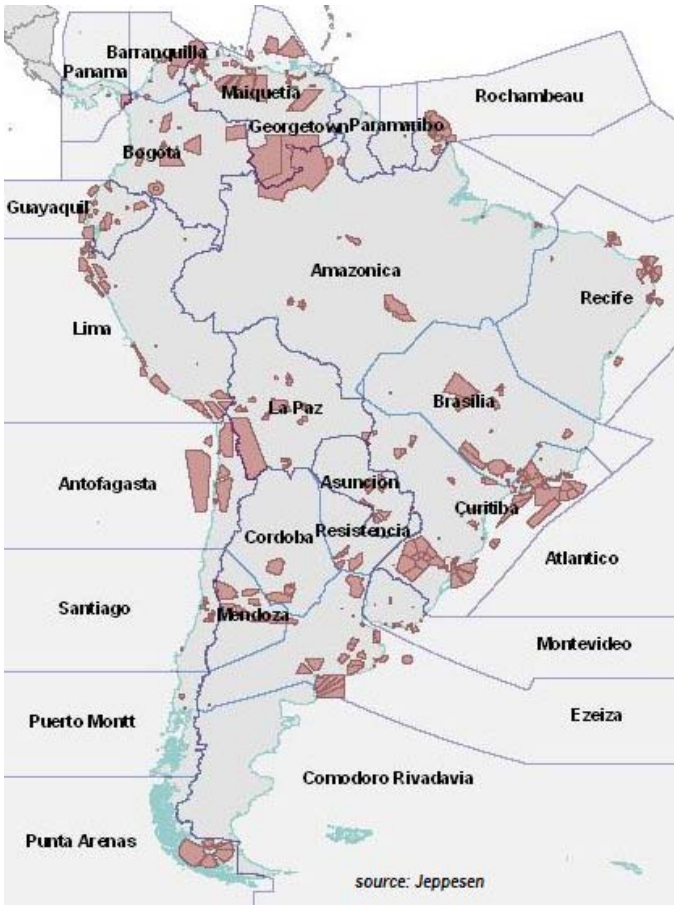
APPENDIX F

Prohibited, restricted and danger areas in the SAM Region

Country	PA	RA	DA	Others	Remarks
Argentina	15	50	1	N/A	
Bolivia	1	23	NIL	N/A	
Brazil	44	228	11	N/A	
Chile	12	32	9	78 areas of volcanic activity	Chile has defined climb areas for weather balloons (5) as prohibited areas.
Colombia	5	11	NIL		
Ecuador	2	11	1	N/A	Ecuador has designated SANGAY volcano area as a danger area.
French Guiana	1	4	9		
Guyana	1	NIL	NIL		
Panama	4	2	4	4 and 1 ADIZ	Panama has designated other areas for air sports and recreational activities
Paraguay	2	9	3	N/A	
Peru	14	22	NIL	N/A	
Suriname	2	1	NIL	N/A	
Uruguay	19	4	2	N/A	
Venezuela	6	36	2	N/A	
TOTAL	**126**	**432**	**42**	**83**	

PA: Prohibited Area
RA: Restricted Area
DA: Danger Area
N/A: Not applicable
NIL: Nothing

Prohibited, restricted and danger areas in the SAM Region



In the South American Region, there are 26 FIRs covering 38'565,578 km2.

Prohibited, restricted and danger areas in the ICAO South American Region
• 628 special use airspaces
• 683 in total, including special areas, such as volcanic, training and others areas

• 2'121,753 km2 in total, defined as special use areas

11.9% of the continental area

APPENDIX G

Sample Form on the use and management of restricted, forbidden and danger areas and special use airspace in the SAM Region

Country: _____
FIR: _____

Date: _____

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

Instructions to complete the form:

1. Type of area or special use aircraft: insert prohibited, restricted, danger area or special use area (recreational, farming activities, etc.).
2. Size: Insert lateral dimension in square kilometers, and vertical dimension indicating upper and lower limits
3. Period of use: Insert the area activation schedule or period, if applicable.
4. Nature of the activity: Insert detailed information of the activity carried out in the area (parachuting, training, etc.).
5. Managed by: Insert the name of the organization or person responsible for area activation.
6. Does it affect current operation? Insert information regarding the impact on the current design of the area.
7. Does it affect ANSP planning? Indicate if ANSP planning may be potentially affected by the area
8. Remarks: Insert additional information that the State should take into account.

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APPENDIX H

Sample of Letter of operational agreement for joint use of restricted areas

(ref. ICAO Circular 330 and Doc 9433)

SUBJECT: Procedures for drawing up the letter of operational agreement for joint use of restricted areas (identify the area or areas related to the LoA)

EFFECTIVE DATE: (insert date).

In accordance with ICAO regulations and procedures and national regulations (insert national reference), the procedures for the use of restricted areas (identify the list of Restricted/Danger Areas on which the LoA is based) are hereby established by (identify civil ATS units) and (identify military units)

Airspace under (identify civil or military units responsible, as required) jurisdiction is exhibited in Annex 1 to this LoA.

At least the following shall be included in Annex 1:

a) Horizontal and vertical limits of the corresponding airspace;

b) Classification of airspace available for civil air traffic;

c) Units or authorities responsible for airspace handover;

d) Conditions for airspace handover to the corresponding ATC unit;

e) Conditions for airspace handover from the corresponding ATC unit;

f) Airspace availability periods;

g) Any limitations on the use of the corresponding airspace; and

h) Any other appropriate procedures or information.

This letter revokes or supersedes the Letter of operational agreement (if any) for joint use of restricted areas (insert previous agreements) dated (insert date).

1. Personnel of (identify the coordinating unit) shall act as liaison between the user and the control body.

2. The user shall:

   2.1. Coordinate activation/release periods of (identify the area or areas related to the LoA) with (identify ATC units to coordinate with)

   2.2. Notify (identify unit) at least 30 minutes prior to the activation of airspace above (identify flight level or altitude expressed in feet, as appropriate) in area (identify the area(s) related to the LoA)

   2.3. Notify (identify unit) at least 2 hours prior to the activation of airspace during periods other than those published in the (identify the area(s) related to the LoA) AIP

   2.4. Notify (identify unit) at least 30 minutes prior to the activation of airspace (identify flight level or altitude expressed in feet, as appropriate) in area (identify the area(s) related to the LoA)

   2.5. Notify (identify unit) at least 48 hours prior to the activation of airspace in (identify the area(s) related to the LoA).

   2.6. Release the (identify the area(s) related to the LoA), as appropriate, above (identify flight level or altitude expressed in feet, as appropriate) to (identify unit) when the area is not being used for the designated purpose.

   2.7. Release the (identify the area(s) related to LoA), as may be appropriate, at maximum required altitudes above (identify flight level or altitude expressed in feet, as appropriate) to (identify unit) due to a traffic emergency situation. The release of airspace to (identify unit) shall be done within 30 minutes after the request is transmitted.

3. The control body shall:

   3.1. Exhaust all possible traffic management procedures before requesting user to release the airspace, as specified in paragraph 2 g.

   3.2. Return (identify the area(s) related to the LoA) promptly to the user once the traffic emergency situation has been resolved.

   3.3. Be responsible for issuing the appropriate NOTAMs for the airspace being use above (identify flight level or altitude expressed in feet, as appropriate)

   3.4. Notify (identify unit) of airspace release periods of (identify the area(s) related to the LoA).

   3.5. Submit in writing, upon written requested from the user, the reasons for requesting the recovery of airspace in restricted areas.

4. The (identify unit) shall be responsible for issuing the appropriate NOTAMs for the airspace being used (identify flight level or altitude expressed in feet, as appropriate)

5. During periods in which airspace is released to the control body, (the user) shall authorize traffic under instrument flight rules (IFR), visual flight rules (VFR) in and throughout the (identify the area(s) related to the LoA)

6. The decision to recover airspace from a restricted area shall be made by supervisory staff of the control body.

Note: Non-supervisory staff of (identify unit) may act as liaison with the user for the release/recovery of (identify the area(s) related to the LoA)

7. Communication between (the user) and (the control body)

7.1. In order to enable effective coordination between the units concerned regarding the procedures established in this LoA, the means of communication described in Appendix 2 will be used and/or implemented.

7.2. These means of communication shall enable communication within (insert time as necessary) seconds and shall have an automatic recording system.

8. Revisions

8.1. This LoA will be revised when the procedures contained therein or in its appendices are affected by amendments to ICAO SARPS, regional supplementary procedures or regional plans, or when the corresponding ATS units implement new communication facilities.

8.2. The body implementing new communication systems is responsible for initiating coordination with the counterpart body.

8.3. If the amendment only affects part of the Appendices, the new amendment may be inserted without modifying the LoA upon agreement between the parties. The effective date of the amendment shall be agreed between the parties.

(ORIGINAL DOCUMENT SIGNED BY) User Representative

(ORIGINAL DOCUMENT SIGNED BY) Control Body Representative

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APPENDIX I

Procedures applicable in Europe for the Flexible Use of Airspace (Ref. Spain AIP)

INTRODUCTION

The flexible use of airspace (FUA) concept is based on that airspace no longer being considered as military or civil airspace but rather as one single continuum that is used flexibly in accordance with day-to-day needs. Consequently, any necessary airspace segregation shall be only temporary.

There are three levels of airspace management:

- Level 1 - Strategic: where long-term planning of the national airspace and airspace structure management policy is defined through a joint civil/military process.
- Level 2 – Pre-tactical: where management is done on a day-to-day basis, on the day before operations, and temporary allocation of airspace is done through the Airspace Management Cell (AMC), which collects and analyses all airspace requests and decides airspace allocation on a daily basis.
- Level 3 - Tactical: where airspace use is managed in real time.

FLEXIBLE AIRSPACE STRUCTURES

The FUA concept complements airspace organization into a series of flexible structures as defined below:

- Temporary Segregated Areas (TSA): airspace of predefined dimensions established in response to civil and military needs that may require temporary reservation of airspace. TSAs are described in ENR 5.2. The AMC manages TSAs at the pre-tactical level the day before operations. They are activated during the period published in the AUP.
- Manageable Danger and Restricted Areas: military areas that, while maintaining their D or R concept, can be managed and allocated by the AMC in the same way as TSAs during the periods of time published in section ENR 5.1.
- Conditional Routes (CDR): non-permanent ATS routes or portions thereof that can only be planned and used under certain specific conditions within the periods of time published in the description of the Conditional Route. Each CDR published in section ENR 3.5 is associated to an alternative route.

CDRs are divided into three categories according to their possible use in the flight plans:

CDR 1 - they are established at the strategic phase (Level 1). They are available most of the time, so they can be permanently included in the flight plans (RPL and FPL). Every day, the AUP and CRAM are distributed with the CDR1 routes that are being closed. The RPLs affected by temporarily closed routes shall be cancelled and a new FPL containing item 15, the published alternate route corresponding to each unavailable CDR1, will be filed. If it is known sufficiently in advance that it will be closed, then it will also be included in the FAUP (AUP forecast issued 30 days in advance of the day of operation). If a CDR1 must be closed to traffic on a short notice, ATC will instruct flights to use alternate routes in the tactical phase.

CDR 2 – they are managed at the pre-tactical phase (Level 2). They cannot be permanently planned. CDR2s may only be included in the FPL, according to the conditions published daily, on the day before operations, though the Conditional Route Availability Message (CRAM). The AMC will issue an AUP forecast (FAUP).

CDR 3 they are managed at the tactical phase (Level 3). They cannot be planned in flight plan. They can only be used subject to ATC clearance, following civil-military coordination. CDRs cross Temporary Segregated Areas (TSA) or Manageable Danger and Restricted Areas. The periods of time during which such routes or route segments are classified as CDR 2 or CDR 3 must coincide with the activity periods of the areas crossed. One same ATS route segment may be conditional 1, 2, or 3 in different periods of times. In Spain, the ATS route is used normally outside of the periods of time and vertical limits published as CDR.

AIRSPACE MANAGEMENT UNITS

Airspace Management Cell (AMC)

It is a national joint civil/military unit responsible for day-to-day management (pre-tactical phase) and temporary allocation of airspace according to the requirements of airspace users (ACC, FMP, military area managing units and other approved agencies). It prepares the Forecast Airspace Use Plan (FAUP) 30 days before the operation. The day before the operation, it prepares the Airspace Use Plan (AUP). In exceptional circumstances, between day D-30 and day D-1, authorized agencies can make modifications to the FAUP, which shall be reflected in the corresponding AUP message.

Centralized Airspace Data Function (CADF)

CADF is a EUROCONTROL unit that collects, analyzes and consolidates all information related to CDRs, as provided by national AMCs through the "Airspace Use Plan" (AUP). The day before operations, the CADF prepares and issues a list of available CDRs through the Conditional Route Availability Message (CRAM)"

PUBLICATION OF INFORMATION ON THE AVAILABILITY OF FLEXIBLE STRUCTURES

Forecast Airspace Use Plan (FAUP)

Every day, the AMC prepares a "Forecast Airspace Use Plan" (FAUP) 30 days before the day of operations. This information will be disseminated through the CFMU, the NOP website and Aena's air navigation website, or through the most effective means available at any time. It is prepared before 1400 hours UTC and is valid for 24 hours starting at 0600 hours UTC of the day of operation. Any exceptional changes that may be introduced will be included in the corresponding AUP.

Update of the Forecast Airspace Use Plan (FUUP)

The AMC may issue and "Update to the Forecast Airspace Use Plan" (FUUP) to amend the FAUP. It will have the same means of distribution as the FAUP. The FUUP will be disseminated before 0900 UTC of day D-29, and will have the same validity period as the original FAUP to which it refers.

Airspace Use Plan (AUP)

The AMC sends the "Airspace Use Plan (AUP)" through the CIAM (CFMU Interface for airspace managers) to the CFMU/CADF before 1400 UTC of the day before the operation, with a validity period of 24 hours starting at 0600 UTC of the next day. The AUP may contain variations to the FAUP. The AUP has the following sections:

A) – List of available CDR 2s.

B) - List of permanent ATS routes and temporarily closed CDR1s.
C) – List of active TSAs and manageable R and D areas.

Example of AUP:

LECBUIR

No.	Route-Portion	FL Block	Validity Period	Remarks
1	UG850: VLC-RESTU	F350-F460	14:30 - 15:30	----
2	UH300: ADX-CLS	F250-F460	12:30 - 14:30	----

LECMUIR

No.	Route-Portion	FL Block	Validity Period	Remarks
1	UA31: CJN-ASTRO	F250-F460	12:30 - 15:00	-----
2	UA31: CJN-ASTRO	F250-F460	22:00 - 22:59	-----
3	UA31: CJN-ASTRO	F250-F460	05:00 - 06:00	-----

B) Closed ATS routes and Category 1 CDR.

LECMUIR

No.	Route-Portion	FL Block	Validity Period	Remarks
1	UG25: STG-KORET	F245-F300	09:00 - 11:30	-----

C) Active TSA and AMC Manageable R & D Areas.

LECMUIR

No.	Route-Portion	FL Block	Validity Period	Remarks	Resp. Unit
1	TSA 28 STG	F245-F300	09:00 - 11:30	----	LECMZAMC

Updated Airspace Use Plan (UUP)

The AMC issues the "Updated Airspace Use Plan (UUP)", which amends the AUP. It has the same format and addressees as the AUP. It makes reference to the number of the AUP it is updating and includes any changes that may occur on the day of operations. It is issued before 0900 UTC on the same day of operations. It has a validity period of 18 hours from 1200 UTC of that day to 0600 UTC of the following day.

Conditional Route Availability Message (CRAM)

The "Conditional Route Availability Message (CRAM)" is issued by the CADF to aircraft operators, ARO, ACC/FMP, AMC of the ECAC area and to the CFMU at 1500 UTC of the previous day of operations and is valid for 24 hours starting at 0600 UTC of the next day. The CRAM is transmitted through the AFTN or SITA and is available on CFMU terminals. It contains the list of airway segments classified as CDR2 that will be available for the period indicated in the message. For security reasons, information published by the AIS on the CDR1s and permanent ATS routes that are closed for specific periods is repeated in the CRAM.

Example of CRAM:

GG LEANZDZX
041524 EUCHZMTA
PART 001 OF 006
CRAM VALID FROM 05/01/1998 06:00 TO: 06/01/1998 06:00 RELEASED: 04:15

A) CDR TYPE 2 AVAILABILITY:

	UA10	TRA	RESIA (LSAZUIR)
1		F200-590	0700-1230
	UA23	ELVAR	BEJ (LPPCUIR)
2		F245-255	0600-0600
	UA31	CJN	ASTRO (LECMUIR)
3		F250-460	0600-0730
4		F250-460	1330-2359
	UA41	SRN	FRANE (LSAGUIR)
5		F200-590	0600-0730

.....

	UZ917	KRH	ADENU (EDUUUIR)
93		F250-290	0600-0600

B) ATS ROUTE AND CDR TYPE 1 CLOSURE:

	UG15	TRT	VIBER (EDBBUIR)
1		F310-350	0730-0930
2		F310-350	1100-1230
3		F310-350	1345-1600
	UG102	HAM	FLD (EDBBUIR)
4		F310-350	0730-0930
5		F310-350	1100-1230
6		F310-350	1345-1600

APPENDIX J

Model of Action plan for the flexible use of airspace (FUA)

NATIONAL PERFORMANCE OBJECTIVE XXX Flexible use of airspace (FUA)	
Benefits	
Safety	• Improved civil/military coordination and cooperation reinforces airspace safety. *Note: include other benefits as necessary)*
Environmental protection and sustainable development of air transport	• Allows for a more efficient ATS route structure, reducing miles flown and fuel consumption, and thus CO2 emissions into the atmosphere. • Increases airspace capacity • Greater availability of reserved airspace at times where there is no activity by the users of this airspace. *Note: include other benefits as necessary)*
Metrics	
• Percentage of special use areas (SUA) coordinated for the application of the FUA concept • Number of letters of operational agreements on civil/military coordination and cooperation • Permanent reduction of the amount of reserved airspace. • *Note: include other metrics as necessary*	

Strategy ***2012 – 2018***				
***Activity**	**Start**	**End**	**Responsible party**	**Remarks**
1. Establish policies and develop standards on FUA (subtasks)				
2. Establish a national high-level committee for civil-Military cooperation and coordination (subtasks)				
3. Sign a memorandum of understanding (MOU) between civil and military authorities (subtasks)				
4. Hold seminars/meetings with civil and military authorities and reserved airspace users to show the importance to airspace use optimization (subtasks)				
5. Evaluate, in an early stage, all restricted, prohibited and danger areas that affect or could affect air flow in order to reduce them as much as possible (subtasks)				
6. Develop a medium-term uniform and collaborative national airspace planning process, taking into account				

all user needs and national security, defense and police requirements (see subtasks)				
7. Implement an airspace management cell (AMC) to conduct an effective coordination in real time (subtasks)				
8. Adopt adequate measures to improve the efficacy of traffic flow management, by developing conditional routes (CDR) that allow dynamic rerouting of aircrafts to avoid special use airspace (subtasks)				
9. establish regulations and procedures to communicate, negotiate and determine priorities for civil-military coordination (subtasks)				
10. Establish, when required by ANSPs, **procedures to coordinate temporary reserved airspace** through the issuance of NOTAMs or specific real-time reservation activation/deactivation procedures (subtasks)				
11. Draft the necessary letters of operational agreement between ATS units and military units or other users for the activation of restricted airspace when necessary (subtasks)				
12. Manage information in order to establish and publish in the AIP the CDR routes and the procedures for activities requiring airspace reservation and restriction (subtasks)				
13. Carry out the safety assessment and risk analysis when FUA measures are introduced (subtasks)				
14. Establish a system to periodically revise airspace requirements, organization and management (subtasks)				
15. Assess training requirements for FUA application and provide the courses that are deemed necessary (subtasks)				
16. Track progress during FUA implementation (subtask)				
* Activity: Indicates the activities required for achieving the performance objective. * End: Insert the date when the task ends. * Responsible party: Insert the name of the unit/person responsible for carrying out the task. * Remarks: Insert any remarks that may help understand the purpose of the task.				

LIST OF SUBTASKS TO ACHIEVE THE FUA PERFORMANCE OBJECTIVE

Note: Tasks included here are for reference only, and are not exhaustive.

1 - Subtasks to establish policies and draw up FUA-related regulations

1. Analyze national documentation and verify if there are any regulations or policies related to the flexible use of airspace.
2. If there are no regulations, revise global and regional documentation as reference material
3. Draft the corresponding standard.
4. Submit the standard to the consideration of the corresponding authorities to check compliance with current legislation.
5. Review remarks that may have been identified in the previous item.
6. Finish the document
7. Submit the document to the aeronautical authority for approval.
8. Take all corresponding action for its inclusion in the national legislation, if applicable.

2- Subtasks to establish a High-Level Committee for Civil-Military Cooperation and Coordination

1. Select the person or group of persons in charge of developing the task and the Committee Secretariat.
2. Evaluate ICAO current provisions related to civil-military cooperation and coordination.
3. Analyze national regulations and status concerning civil-military coordination and cooperation.
4. Draft the terms of reference and committee objectives.
5. Develop a work program
6. Evaluate who is eligible to participate in the National Committee (civil/military aviation representatives, and/or other airspace users, where necessary)
7. Send invitations for the first Meeting of the Civil/Military Coordination and Cooperation Committee
8. Hold the first Meeting of the Committee
9. Submit the terms of reference and work program to the Committee for its consideration.
10. Approve the terms of reference and work program.
11. Set meeting schedule based on the work program.

3- Subtasks to draft the Memorandum of Understanding (MOU)

1. Review national regulations related to Civil-military coordination.
2. Evaluate previous global and national experiences
3. Draft the MOU
4. Submit the MOU for consideration by national authorities for review.
5. Review all observations made to the document, if applicable.
6. Submit MOU to the consideration of the high level Committee for civil-military cooperation and coordination.
7. Approve the MOU
8. Take appropriate actions for MOU to come into effect.

4 – Subtasks to hold seminars and meetings with civil and military authorities, and reserved airspace users

1. Evaluate the need for seminars related to FUA
2. Evaluate the need to hold meetings with the parties involved in the FUA concept.
3. Prepare a plan of activities regarding seminars and/or meetings.

4. Prepare material for seminars on FUA
5. Prepare material and documentation for holding meetings on FUA.
6. Coordinate the development of activities with all the parties involved.
7. Send invitations for scheduled activities.
8. Carry out the activity
9. Prepare a report with the results of the activities
10. Submit the results of the activities, as established.
11. If necessary, track results and their implementation in terms of time and form.

5- Subtasks to evaluate, in an early stage, all restricted, prohibited, and danger areas that affect or could affect circulation

1. Review national regulations related to the implementation of prohibited, restricted, and danger areas.
2. Analyze all restricted, prohibited, and danger areas that have been implemented in each State, using the sample form for the use and management of restricted, prohibited, and danger areas and special use airspace in the SAM Region contained in Appendix F.
3. Consider in the analysis the unmanned aircraft systems (UAS)
4. Verify if it is possible to reduce, eliminate or modify SUA structure
5. Identify those SUAs that may be used dynamically by applying the FUA concept.
6. Analyze different scenarios in order to apply strategic airspace management.
7. Analyze different scenarios in which, due to safety, it may be necessary to establish procedures or conventions to avoid tactical airspace management.
8. Establish guidelines, in an early stage, to allow timely and foreseeable access to restricted or reserved airspace, in order to maximize benefits.
9. Take appropriate action in order to authorize dynamic use of special use areas.

6- Subtasks to develop a uniform and collaborative national airspace planning process regarding FUA

1. Analyze ICAO regulations regarding CDM.
2. Evaluate national regulations on CDM, and if there are none, establish the criteria for their application (See CDM SAM).
3. Identify the areas that will participate in airspace planning.
4. Verify that FMUs and/or FMPs are represented.
5. Analyze airspace structure taking into account user needs, especially national security, defense and police requirements.
6. Identify special use airspace at national level that may prevent flexible use of airspace.
7. Create national plans to optimize airspace structure taking into account the application of the FUA and CDO concepts.
8. Review national plans to optimize airspace structure in accordance with FUA and CDO, where applicable.
9. Propose to the corresponding planning area the adjustments necessary to accommodate national, defense and police requirements.
10. Verify that all proposals are incorporated into the national air navigation plan of the State.

7- Subtasks to implement the airspace management cell (AMC)

1. Analyze the need to establish an AMC for the management of special use airspace in the pre-tactical and tactical phase.
2. Define activities that AMC will carry out when coordinating civil/military/police operations including the following:
   a) Granting of authorizations for aircraft overflights
   b) Coordination of unusual military traffic in airspace

c) Real-time coordination of SUA activation/release periods with ATC units
d) Application of the FUA concept in daily operations
e) Management of conditional routes (CDR) in close cooperation with ATC units.
f) Drafting of the Forecast Airspace Use Plan (FAUP)
g) Drafting of the Airspace Use Plan (AUP).

3. Establish agreements between ATC and AMC units.
4. Develop applicable procedures.

8 - Subtasks to adopt suitable measures to improve the efficiency of traffic flow management

1. Evaluate the application of conditional routes at global and regional level
2. Review national special use airspace planning that may affect the efficiency of civil operations.
3. Identify the SUAs that may be appropriate for implementing the CDRs.
4. In coordination with parties involved in CDM, develop conditional routes (CDR) for dynamic rerouting of aircraft to avoid special use airspace.
5. Training ATC staff on the application of CDR routes and procedures for coordination and cooperation with the areas involved.
6. Publish CDR routes in the AIP
7. Insert CDR routes and all associated procedures in the operational manuals.
8. Set the date(s) for CDR implementation.
9. Perform risk management before CDR implementation
10. Track CDR application

9- Subtasks to establish regulations and procedures to communicate, negotiate, and determine priorities for civil-military coordination

1. Evaluate existing State regulations and procedures.
2. Analyze means of communication between ATC and military units.
3. Establish means of communication
4. Develop applicable procedures.
5. Define the criteria to be used for determining civil-military coordination priorities
6. Submit these criteria to the consideration of involved parties for approval.
7. Include primary and secondary means of communication in letters of operational agreement.
8. Include applicable procedures in the letters of operational agreement.
9. Train ATC and military personnel on the use of applicable means and procedures.
10. If necessary, publish all corresponding procedures in the AIP
11. Implement the means of communication and procedures.
12. Periodically check the operation of the means of communication.
13. Periodically check if procedures meet airspace user requirements, and if civil-military coordination is being carried out effectively.

10 – Subtasks to establish procedures to coordinate temporary reserved airspace (TRA)

1. Verify TRA coordination procedures at national level.
2. If there are no procedures, define such procedures, including real-time activation/release.
3. Check if temporary reservation is done through NOTAM or through real-time specific reservation activation/deactivation procedures.
4. Submit procedures to the consideration of the parties involved.
5. Following their approval, include TRA coordination procedures in the letters of operational agreement between ATC and military units.
6. Train ATC and military staff on the implementation of TRA coordination procedures.
7. If necessary, publish all corresponding procedures in the AIP

8. Implement procedures
9. Periodically check if procedures meet TRA coordination requirements and if coordination is carried out effectively.

11 – Subtasks to draft Letters of Operational Agreement between ATS units and military units or other users

1. Assess current procedures for the activation of restricted airspace when so required
2. Agreements and procedures for flexible use of airspace may be established in the Letters of Operational Agreement, which shall include the following items:
   a) horizontal and vertical limits of the airspace concerned;
   b) the classification of the airspace available for use by civil air traffic;
   c) units or authorities responsible for airspace handover;
   d) conditions for airspace handover to the ATC unit concerned;
   e) conditions for airspace handover from the ATC unit concerned;
   f) airspace availability periods
   g) any limitations on the use of the airspace concerned; and
   h) any other relevant procedures or information.
3. Train ATC and military personnel on the use of the LoA.
4. If necessary, publish all corresponding procedures in the AIP
5. Implement the LoA
6. Periodically review the LoA to verify that it effectively meets civil-military coordination requirements.

12- Subtasks for managing information in order to establish and publish CDR routes in the AIP, and procedures for activities requiring reserved and restricted airspace

1. Negotiate with the corresponding AIS office.
2. Check the time required for the relevant information to be duly published
3. Coordinate with the AIS office the establishment of a publication timetable and the dates in which information must be available in the AIS
4. Check information before publication to ensure its accuracy.
5. Check that information is being published in accordance with national regulations.
6. Verify that publication dates are effectively met

13- Subtasks to carry out the safety assessment and the risk analysis when FUA measures are introduced

1. Contact the local safety office
2. Verify the time required to perform the safety assessment of FUA procedures and measures to be implemented.
3. Coordinate with the local safety office who will perform the risk analysis
4. Supply all the information needed by the safety office
5. Participate as an observer during risk analysis sessions.
6. Verify that the outcome meets the level of safety agreed by the State.
7. Communicate the outcome to the corresponding State authorities
8. Verify that risk mitigation actions are executed before FUA measures and/or procedures become effective.
9. Track FUA measures and procedures implemented to ensure that safety is not affected.

14- Subtasks to establish a system to periodically review airspace requirements, organization and management

1. Create a strategy to periodically review airspace requirements, organization, and management.

2. Submit this strategy to the Civil- Military Cooperation and Coordination Committee.
3. Approve the strategy
4. Implement appropriate action to comply with the strategy approved.
5. Verify compliance with the objective established in the strategy.

15- Subtasks to assess training requirements for the application of FUA and to provide the necessary courses

1. Evaluate national regulations and other documentation related to personnel training.
2. Verify if current documentation contains adequate material for FUA to be successfully implemented.
3. Analyze the topics that shall be included in the courses concerning FUA
4. Coordinate with the corresponding Civil Aviation Training Centre (CATC) the inclusion in the curriculum of topics related to FUA.
5. Coordinate with CATC the specific training and seminars that would be required for FUA implementation.
6. Assist the CATC in all matters related to FUA.
7. Verify that training related to FUA is being provided effectively.

16- Subtasks to track progress during the implementation of FUA

1. Strictly monitor progress in the implementation of FUA in the State.
2. Verify the results of all processes related to FUA.
3. Inform the Civil-Military Cooperation and Coordination Committee of all aspects that might prevent the effective implementation of the FUA
4. Take appropriate measures to overcome obstacles for the implementation of the FUA.
5. Verify that measures taken will overcome the difficulties encountered.

REFERENCE DOCUMENTS

- Convention on International Civil Aviation (The Chicago Convention)
- Annex 2, - *Rules of the air,*
- Annex 11 –*Air Traffic Services,*
- PANS-ATM, Doc. 4444 - *Procedures for Air Navigation Services — Air Traffic Management*
- Doc. 9554 -*Manual concerning Safety Measures Related to Military Activities Potentially Hazardous to Civil Aircraft Operations*
- Doc. 9426 –*Air Traffic Services Planning Manual*
- Doc. 9750 –*Global Air Navigation Plan*
- Doc. 9854 – *ICAO Global Air Traffic Management Operational Concept*
- Doc. 8126 – *AIS Manual*
- Assembly Resolution A 37-15 - Consolidated statement of continuing ICAO policies and associated practices related specifically to air navigation.
- Reports of Air Navigation Regional Meetings for the CAR/SAM Regions (CAR/SAM RAN)
- Global Air Traffic Management Forum on Civil/Military Cooperation (2009)
- Circular 330-AN/189 – *Civil-Military Cooperation in Air Traffic Management*
- GREPECAS meetings– Caribbean and South American Regional Planning and Implementation Group
- Performance-Based Air Navigation System Implementation Plan for the South American Region (SAM-PBIP)
- CDM Manual for the SAM Region
- ATFM Manual for the CAR/SAM Regions
- SAMIG Meeting Reports
- RAAC Meeting Reports - Meeting of Civil Aviation Directors
- Report of the Seminar on Civil/Military Coordination and Cooperation and flexible use of airspace for the NAM, CAR, and SAM Regions (2011)

- Spain AIP
- Regulation 2150/2005 - Common Rules for the Flexible Use of Airspace European Commission
- Single European Sky -European Organization for the Safety of Air Navigation (EUROCONTROL)
- NextGen –Federal Aviation Administration (FAA)

APPENDIX C

APPENDIX C (REVISED 12/10/11)

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.
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	**Completed**
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	**Completed** Secretariat sent request to States for data collection through letter LT 2/3A.13-LN 3/24.6.1-SA364 dated 8 June 2009. Deadline reply: 9 September 2009. Except for French Guyana and Panama all SAM States sent data collection.

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	**Completed** 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	**Completed** Argentina, Bolivia, Brazil, Chile, Colombia, Guyana, Paraguay, Peru, Suriname, Uruguay and Venezuela.
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)	**Completed** 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)	**Completed** Three persons for a period of 3 weeks in order to carry out study. This requirement will be presented to the RLA/06/901 RCC meeting. 3 persons for a 3 week period. 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	**Completed** This task requires the hiring of 1 expert in order to carry out required assessment applying SMS. This requirement will be presented to the RLA/06/901 RCC meeting. 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	**Completed** This task requires the approval of the RCC meeting, in order to be able to count with RLA/06/901 support. 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	**Completed** 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	**Completed** 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			**Completed**
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 FUA LOA • 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/ ATSRO/3	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 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	The information on RNAV5 approval is being sent to CARSAMMA and air

			IATA	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. Prepare letters of agreement and contingency with adjacent States		SAM/IG/10	States	
3.2.5. 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	SAM/IG/7	SAM/IG/9	SAM/PBN/IG (Project RLA/06/901)	Hiring of two experts is programmed for a three-week period during second half of February 2012.

realigned in keeping with possible 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. • Prepare optimisation plan for restricted, prohibited, dangerous and reserved use in the SAM Region. • Application of CDO techniques.				
3.2.6. Carry out a Seminar/Workshop/Meeting on Airspace Planning	ATSRO/3	February 2012	Regional Project RLA/06/901	Request support of Regional Project RLA/06/901 and DECEA (Brazil). The ICAO Secretariat should send a letter to DECEA to request two instructors. The objective is to prepare airspace planning from States of the Region for the second half of February 2012 in Lima.
3.2.7. Carry out the Fourth ATS Routes Network Optimisation Workshop/Meeting for the SAM Region (SAM ATSRO/04)		April 2012	Regional Project RLA/06/901	

3.2.8.	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.
3.2.9.	Prepare safety assessment required, applying a quantitative methodology through the use of SMS	SAM/ATSRO/ 4	SAM/IG/10	Regional Project RLA/06/901	The hiring of an expert for a two-week period is required to carry out this work. States should carry out a safety analysis for the changes in terminal areas.
3.2.10.	Hold the Fifth Workshop/Meeting for the ATS routes network optimisation of the SAM Region (SAM ATSRO/05), s to review and validate the studies made in items 3.2.5, and 3.2.8.	SAM/IG/10	March 2013	Project RLA/06/901 States	
3.2.11.	Carry out the Third Workshop/Seminar/Meeting on risk analysis of Version 02 of the ATS routes network for the SAM Region. Validation of the study of 3.2.9.	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			