



**Agenda Item 2: RNAV5 Implementation Programmes and SAM Region ATS routes network
Optimisation**

RNAV5 implementation programme

(Presented by the Secretariat)

Summary

This working paper presents information on the performance-based navigation (PBN) implementation programme in the South American Region, and particularly the task of carrying out the safety assessment before RNAV5 implementation, foreseen for 18 November 2010 in continental RNAV routes of the Region.

References:

- ICAO Annex 11
- ICAO Doc 9613 – PBN
- RNAV5 implementation programme and associated action plan

ICAO Strategic objectives

Strategic Objective A *Safety*

Strategic Objective D *Efficiency*

1 Background

1.1 Several implementation programmes are being executed in the ATM and CNS fields during the South American Region Implementation (SAM/IG) Meetings. Among these projects, the following are:

- a) PBN en-route and approach implementation,
- b) ATS routes structure optimisation,
- c) Air traffic flow management,

- d) Operational requirements assessment, to determine implementation of improvements in communications, navigation and surveillance capabilities for en-route and terminal area operations; and
- e) Operational implementation of new ATM automated systems and integration of the existing systems.

1.2 Regional Project RLA/06/901 supports these implementation programmes, which enables a continuous development of the project, and especially the possibility to hire experts to develop and deliver the necessary documentation for the SAMIG Meetings/Workshops analysis, for execution at a regional and national level.

2 Analysis

2.1 The PBN en-route implementation programme has the goal to detail the activities of the performance-based navigation implementation project, en-route operations, with RNAV5 application, at the South American Region, in a short term. Also, the document specifies the results to be obtained in each one of the activities of the plan. The SAM implementation Group has prepared and approved the corresponding action plan, in order to make a permanent follow-up of the activities to be executed by the different parties involved. For ease of reference of the meeting, the RNAV5 implementation programme is attached as **Appendix A** to this working paper. The associated action plan contains a series of tasks to be executed before the implementation itself.

2.2 With regard to RNAV5 en-route implementation, among other aspects, some principles established must be followed:

- 1) Performance-based air traffic management is structured on the basis of the principle that ATM community could be best attended through quantification of these needs. Then, a set of objectives, goals and performance indicators must be established, to enable to objectively justify the projects that are oriented towards the implementation of performance improvements on air traffic management system.
- 2) The estimate of future ATM system performance will be of utmost importance to orient the planning process of the improvements to be implemented. Investigation and development initiatives must be organised in order to favour risk analysis for the following situations:
 - a. Consequences of maintaining the current status of the ATM system, without any changes. In that case, the ATM system would be subject to changes outside the service provider field of operation, such as air traffic growth, changes in fleet composition, etc., and
 - b. Consequences of the implementation of changes that do not provide the intended improvement in the system performance, without attending performance established goals.

2.3 In case of simple implementations, such as an RNAV route, the Key Performance Areas (KPA) involved are safety, efficiency and environment protection. Safety may be measured in a qualitative manner, through a safety case. Efficiency and environment protection are intrinsically related, keeping in mind that an increase in efficiency normally results in a reduction in fuel consumption, favouring a reduction in the amount of gas emissions in the atmosphere. At least, RNAV5 routes implementation must measure the flight time and fuel saving. It is important to emphasize that not always the implementation of an RNAV route will result in flight time reduction, keeping in mind that the objective of its implementation may be, for example, simplification of entry and exist flows of a TMA, favouring a lower workload for air traffic controllers, and consequently, a greater ATC capacity. In this case, it is also possible that a larger route will favour the necessary conditions for the use of Continuous Descent Approach (CDA) procedures.

2.4 In more complex implementations, for example, a complete routes network restructuring, performance assessment shall normally depend on the use of specific tools, such as Fast Time Simulation (FTS), since a complete assessment of the system will be necessary, in an integral way, which would difficult a “manual” assessment. So, in case the SAM/IG decides for the complete route network structuring, the analysis of alternatives to use the necessary assessment tools, will be required.

2.5 At least, PBN implementation must consider the flight time and fuel consumption savings, as well as the reduction of harmful gas emission in the atmosphere. IATA has developed a fuel saving estimation form that may be applied to measure the system performance. This form may be obtained in the ICAO SAM Office’s website.

2.6 The aspects related to safety itself, are incorporated in WP/02 of this Workshop/Seminar.

2.7 The following tasks has been identified in the RNAV5 action plan:

2. Safety assessment	Start	End	Responsible	Remarks
2.1 prepare the safety assessment applying a qualitative methodology through the application of SMS.	SAM/IG/2	SAM/IG/6	CARSAMMA Regional Project RLA/06/901 Regional Office	Transferred Transferred to the SAM routes network optimisation programme (2.2.6 of the action plan for the SAM ATS routes network optimisation). Regional Project RLA/06/901 will carry out the safety assessment process through a Meeting/Workshop and mission of a risk analysis expert.

2.8 As the Meeting may note, the implementation programme is very specific as regards safety assessment and its result must be presented to the SAM/IG/6 Meeting; i.e. October 2010.

2.9 While the activity related with safety is, according to the action plan, confined to RNAV5 implementation, States at a national level should implement PBN based standardised departures and arrivals. In this connection, the task to be executed during the current Workshop/Seminar, as well as the activity to be carried out by the expert will be the reference material for States to use when making the safety assessment in their TMAs and approaches.

3 **Suggested action**

3.1 In view of the above, the meeting is invited to:

- a) Assist in the execution of safety for RNAV5 implementation; and
- b) Establish the assessment mechanism applying SMS to serve as reference material for safety management activities for PBN application in terminal areas and approaches, activity which each State will have to execute in their respective airspaces.

APPENDIX A

**SHORT-TERM EN-ROUTE PBN ACTION PLAN (RNAV-5)
(GPIs 1, 4, 5, 7, 8, 10, 11, 12, 16, 21, 23)**

1. Airspace concept	Start	End	Responsible party	Remarks
1.1 Establish and prioritize strategic objectives (safety, capacity, environment, etc.)	June/2008	SAM/IG/2	SAM/PBN/IG (Project RLA/06/901)	Completed
1.2 Collect traffic data in order to understand traffic flows in a given airspace	June/2008	SAM/IG/4	SAM/PBN/IG (Project RLA/06/901)	Completed
1.3 Analyze the navigation capacity of the aircraft fleet	June/2008	SAM/IG/4	SAM/PBN/IG (Projects RLA/06/901 and RLA/99/901) States IATA	Valid 95% of the fleet in the SAM Region is candidate for RNAV5 approval. States should continue their efforts to complete the data base (Conclusion SAM/IG/4-3)
1.4 Analyze ground-based means of communication, navigation (VOR, DME) and surveillance to meet navigation specifications and the navigation reversal mode	June/2008	SAM/IG/6	SAM/PBN/IG (Projects RLA/06/901 and RLA/99/901) States	Valid The work will be completed in order to prove that the coverage and geometry corresponds to RNAV5
1.5 Optimize airspace structure, reorganizing the network or implementing new routes based on the strategic objectives of the airspace concept, taking into account airspace modelling, ATC simulations (fast time and/or real time), live tests, etc.	SAM/IG/2	SAM/IG/4	SAM/PBN/IG (Project RLA/06/901) States IATA	Transferred. The meeting reviewed this task and decided that it was more appropriate to incorporate to the SAM Region ATS routes network optimization action plan (2.2.5 SAM Region ATS routes network optimization action plan)

2 Safety assessment	Start	End	Responsible party	Remarks
2.1 Prepare safety assessment execution using a qualitative methodology through the application of SMS	SAM/IG/2	SAM/IG/6	CARSAMMA Project RLA/06/901 Regional Office	Transferred. Transferred to the SAM Region ATS routes network optimization action plan (2.2.6 of the SAM Region ATS routes network optimization action plan). Regional Project RLA/06/901 will carry out the evaluation process of safety through a Meeting/Workshop and mission of a risk analysis expert.

3 Establish a collaborative decision-making process (CDM)	Start	End	Responsible party	Remarks
3.1 Coordinate planning and implementation requirements with air navigation service providers, regulators, users, aircraft operators and military authorities	SAM/IG/2	SAM/IG/6	SAM/PBN/IG States	<p>Valid</p> <p>Some States have published an initial AIC. Other States have not done so yet.</p>
3.2 Establish the implementation date	SAM/IG/1	SAM/IG/4	SAM/PBN/IG States	<p>Completed.</p> <p>18 November 2009 was established as tentative date. States must analyse the feasibility of the tentative date in coordination with domestic operators and military authorities</p>
3.3 Establish the documentation format in the SAM PBN website	SAM/IG/1	SAM/IG/2	SAM Regional Office	<p>Completed</p>
3.4 Report planning and implementation progress to the corresponding Regional Office. Conclusion to present national plans at SAM/IG/4	SAM/IG/2	SAM/IG/4	SAM/PBN/IG States	<p>Completed.</p> <p>Eight SAM States presented a draft of their national PBN implementation plans and it was agreed that for 31 December 2009, States shall present the final version of the plan. The Secretariat was requested to as States that have not done so yet, submit their respective plans.</p>

4 ATC automated systems	Start	End	Responsible party	Remarks
4.1 Assess PBN implementation in ATC automated systems, taking into account amendment 1 to the PANS/ATM (FPLSG). Note: It is not a requirement for RNAV5 implementation	June/2008	SAM/IG/4	SAM/PBN/IG (Project RLA/06/901)	Completed According to the programme presented in ICAO guidelines (WP/09), it is not a requirement for the RNAV5 implementation. CNS/ATM sub-group will revise this issue.
4.2 Implement necessary changes in automated ATC systems	SAM/IG/2	TBD	States	Completed

5 Aircraft and operator approval	Start	End	Responsible party	Remarks
5.1 Analyze aircraft and operator approval requirements (pilots, dispatchers and maintenance personnel) in keeping with the PBN manual, and develop the necessary documentation.	June/2008	SAM/IG/2	Regional Project RLA/99/901-Regional Safety Oversight Cooperation System	Completed
5.2 Publish national regulations for the implementation of the RNAV-5 navigation specification	SAM/IG/2	SAM/IG/6	States	Valid There are some States in development process of their regulations, and for this reason, this task is pending. Five States of the Region have published the regulations and 3 States informed that this task is in execution. No information is available from 6 States.
5.3 Begin the approval of aircraft and operators	SAM/IG/3	SAM/IG/6	States	Valid This is a continuous task that States have initiated and shall continue to carry out upon requirement of operators. Operators should be encouraged to initiate this process.
5.4 Establish and keep up to date a registry of approved aircraft and operators	SAM/IG/3	Permanent	CARSAMMA States Regional Office	Valid This is an activity being developed permanently by each one of the States.
5.5 Verify the operation of the continuous monitoring programme (aircraft and procedures)	Nov/2010	Permanent	States	Completed This is an activity being developed permanently by each one of the States and is considered in the surveillance plans.

6	Standards and procedures	Start	End	Responsible party	Remarks
6.1	Assess and, if applicable, publish the regulations on the use of GNSS.	June/2008	SAM/IG/2	SAM/PBN/IG (Project RLA/06/901) States	Completed
6.2	Finalize WGS-84 implementation	TBD	TBD	States	Completed States which have not done so, should provide the information
6.3	Develop an AIC model to report PBN implementation plans	June/2008	SAM/IG/2	SAM/PBN/IG (Project RLA/06/901)	Completed
6.4	Publish the AIC reporting PBN implementation plans	SAM/IG/2	SAM/IG/4	States	Completed States should publish on 9 April 2009
6.5	Develop an AIP Supplement model containing applicable standards and procedures, including the corresponding in-flight contingencies	SAM/IG/4	June 2010	SAM/PBN/IG (Project RLA/06/901)	Valid RLA/06/901 will carry out this task through the mission of an expert on this matter.
6.6	Publish the AIP Supplement containing applicable standards and procedures, including the corresponding in-flight contingencies	SAM/IG/5	SAM/IG/6	States	Valid
6.7	Review the Procedural Handbook of the ATS units involved	SAM/IG/5	SAM/IG/6	States	Valid
6.8	Update the letters of agreement between ATS units	SAM/IG/5	SAM/IG/6	States	Valid
6.9	Develop an amendment to regional documentation, if necessary	SAM/IG/3	June 2010	SAM/PBN/IG (Project RLA/06/901)	Valid RLA/06/901 will carry out this task through the mission of an expert on this matter.
6.10	Submit a proposal of amendment to Doc. 7030, if necessary	SAM/IG/5	SAM/IG/6	SAM Regional Office	Valid

7. Training	Start	End	Responsible party	Remarks
7.1 Develop a training and documentation programme for operators (pilots, dispatchers and maintenance personnel)	SAM/IG/4	SAM/IG/5	Regional Project RLA/99/901	Completed The matters to be incorporated into each one of the training programmes of operators have been included in the corresponding advisory circulars
7.2 Develop a training and documentation programme for air traffic controllers and AIS operators	SAM/IG/4	SAM/IG/5	SAM/PBN/IG (Project RLA/06/901)	Completed
7.3 Develop a training programme for regulators (aviation safety inspectors)	SAM/IG/4	SAM/IG/5	RLA/99/901 States	Completed The SRVSOP technical committee has proposed a training programme oriented to the authorities
7.4 Conduct training programmes	SAM/IG/5	SAM/IG/6	States	Valid Only some States have initiated this process.
7.5 Conduct seminars for operators, explaining plans and expected operational and economic benefits	SAM/IG/1	SAM/IG/6	States	Valid There is information that only some States have initiated the guidance process to users, and therefore all States are encouraged to implement the dissemination programme among such users.

8. Implementation decision	Start	End	Responsible party	Remarks
8.1 Assess the available operational documentation (ATS, OPS/AIR)	SAM/IG/5	N/A	States	Valid
8.2 Assess the percentage of aircraft and operators (non-exclusionary airspace)	SAM/IG/5	N/A	States	Valid It was decided to carry out a new air traffic data collection comprised within the period 1-15 July 2010
8.3 Analyze the results of the safety assessment	SAM/IG/5	N/A	States	Valid
8.4 Publish trigger NOTAM	Nov/2010	N/A	States	Valid

9. Performance monitoring system	Start	End	Responsible party	Remarks
9.1 Develop a post-implementation en-route operations monitoring programme	SAM/IG/4	SAM/IG/5	SAM/PBN/IG (Project RLA/06/901)	This task will be developed together with an AIP Supplement, Amendment 7030
9.2 Implement a post-implementation en-route operations monitoring programme	Nov/2010	Nov/2011	States	
Pre-operational implementation date	18 November 2010	N/A		Valid SAM/IG/4 defined the tentative implementation date 18 November 2010.
Definitive implementation date	Nov/2011	N/A		