AP/ATM/3
WP/6
07/05/02

International Civil Aviation Organization
UNDP/ICAO Regional Project RLA/98/003
Transition to the CNS/ATM Systems in the CAR and SAM Regions

Third Meeting/Workshop of ATM Authorities and Planners
(Lima, Peru, 20-24 May, 2001)

Agenda Item 3: Review of the Action Plan for the Implementation of the RNP 10 Pre-operational Trial and Demonstration Programme in route UT (UL) 780 and its parallel route.

RNP Action Plan

(presented by the Secretariat)

Summary

This working paper contains the Action Plan for the Implementation of the RNP 10 Pre-operational Trial and Demonstration Programme in route (UL) 780 and its parallel route.

References:
- Report of the CAR/SAM RAN /3 meeting
- CAR/SAM ANP -FASID
- GREPECAS 10 report
- UNDP/ICAO Project RLA/98/003
- Annex 11, Air Traffic Services
- Doc. 9613, RNP Manual
- Doc. 9689, Manual on the Airspace Planning Methodology to determine Separation Minima
- Doc. 4444 – Air Traffic Management

1. Introduction

1.1 The increasing implementation of RNAV routes with RNP values in the North Atlantic, Asia-Pacific and in the South Atlantic (SAT) EUR/SAM corridor has shown that improved aircraft navigation performance enables the use of reduced lateral and longitudinal separation minima, a better route structure and an increase in airspace capacity, while maintaining or improving the required safety levels.

1.2 During the Third CAR/SAM RAN meeting held in Buenos Aires, Argentina, in October 1999, the CAR/SAM Regional Planning and Implementation Group (GREPECAS) was asked to identify areas in the CAR/SAM Regions for the implementation of RNAV RNP and reduced lateral separation minima.

1.3 The GREPECAS 10 meeting (Las Palmas, Canary Islands, Spain, October 2001), taking into consideration a proposal of the AP/ATM/2 meeting held in Lima, Peru, in May 2001, approved and requested Project RLA/98/003 to start an RNP 10 Pre-operational Trial and Demonstration Programme in the airspace between Santiago de Chile and Miami, along route UT (UL) 780 and its parallel route.

1.4 The Fourth Coordination Meeting of the UNDP/ICAO Project RLA/98/003, "Transition to the CNS/ATM Systems in the CAR/SAM Regions" (Lima, Peru, December 2001), decided to include in its work programme the preparation and implementation of actions conducive to assisting States with RNP implementation in the CAR/SAM Regions.

2. Analysis

2.1 The AP/ATM/2 meeting approved the definitive implementation of route UT (UL) 780 and the elimination of the Ventanas (VTN) VOR/DME – Salinas (SLS) VOR/DME segment of route UL 312. At present, this proposal of amendment to the CAR/SAM ANP-Basic Vol. is awaiting approval by the ICAO Council.

2.2 The elimination of the aforementioned segment of route UL 312 was the starting point for the proposal to begin RNP 10 pre-operational trials and demonstrations in route UT (UL) 780 and route UL 302, since there would be a spacing of 50 NM between the two routes in the Tongoy (TOY) VOR/DME – Lima (LIM) VOR/DME segment.

2.3. The study carried out in the airspace of the Santiago-Lima/Miami traffic flow and subsequent coordinations made so far with the parties involved reveal that:

a) The corresponding assessment of routes UT (UL) 780 and UL 302, which run parallel to each other in the Santiago-Lima segment and are not crossed by other routes, shows that there would be no problem in assigning them RNP 10 values in that segment.

b) The extension of route UL 302 along the East of route UT (UL) 780, which would cross over the Andes in the Lima and Guayaquil FIRs, was objected by IATA because some operators have aircraft that are restricted to fly over the mountain, since they lack the equipment to supply passengers with oxygen for more than 15 minutes in the event of a pressure loss.

c) This route, which would continue along East of route UT (UL) 780, would be affected by prohibited areas in the Guayaquil FIR.

d) The parallel route that runs West of route UT (UL) 780 would be affected by prohibited areas in the Lima, Guayaquil and Miami FIRs.

e) Entrance into the Miami FIR is restricted to established routes; therefore, this route that would continue along West of route UT (UL) 780 would have to move even further West, thus increasing flight distance.

Note: The Secretariat will make a presentation during the AP/ATM/3 meeting to graphically explain the analysis carried out in the Santiago-Lima-Miami traffic flow airspace.

2.4 Therefore, considering the many parameters that must be analysed for RNP 10 implementation in the Santiago-Lima-Miami traffic flow, the meeting will have to evaluate the considerations put forward in this working paper for the establishment of a route parallel to route UT (UL) 780.

2.5 En-route ATM evolution in the CAR/SAM Regions has been planned taking into account, first of all, the improvements that could be made in a homogeneous manner to current systems and technology of each aircraft. Consequently, the application of reduced separations using RNP 10 is one of the alternatives available to achieve this necessary increase in airspace capacity. (Doc 9613, *Manual on Required Navigation Performance (RNP),* details the requirements applicable to all aircraft intending to operate in an RNP air space.)

2.6 Safe RNP implementation requires the establishment of safety management measures, which include, *inter alia,* an airspace safety assessment prior to implementation and the establishment of an airspace surveillance programme to guarantee maintenance of the required safety level. (Doc. 9689, *Manual on the Airspace Planning Methodology to determine Separation Minima,* explain in detail all aspects related to the implementation process.)

2.7 In this respect, the meeting should also consider aspects concerning the costs involved in said programme, as well as the benefits expected as a result of the implementation. There will be some costs will have to be financed by the administrations involved, and also by the operators.

2.8 Moreover, bearing in mind the increasing implementation of RNAV routes with RNP values and the need to rationalize the CAR/SAM ATS route network and to harmonize regional implementation plans, States will have to consider, in addition to their national RNAV route implementation plans, the development of a national plan for the implementation of RNP in their respective FIRs.

2.9 **Appendix A** to this working paper contains the Action Plan for the Implementation of the RNP 10 Pre-operational Trial and Demonstration Programme in route UT (UL) 780 and its parallel route, describing the activities to be carried out by States, GREPECAS, the Regional Monitoring Agency, the entity in charge of doing the safety assessment, users, IATA and ICAO. It also shows the target dates for the completion of such activities. The dates shown in this Plan are tentative and to be used as a reference. In light of the agreements reached during the meeting, this Action Plan will have to be revised and the relevant modifications made.

2.10 **Attachment 1 to Appendix A** shows the tasks and responsibilities of a Monitoring Agency**. Attachment 2 to Appendix A** contains the basic information required for the safety assessment**.**

2.11 **Appendix B** to this working paper shows some requirements to be met prior to implementation.

3. Suggested action

3.1 The meeting is invited to:

a) examine the problems described in paragraphs 2.3 and 2.4 of this working paper;

b) review the Action Plan for the Implementation of the RNP 10 Pre-operational Trial and Demonstration Programme in route UT (UL) 780 and its parallel route, which appears in **Appendix A**;

c) if applicable, after analysing this matter, take the corresponding action and decisions; and

d) if deemed relevant, agree that the States draw up a national RNP implementation programme.

Appendix A

ACTION PLAN FOR THE RNP 10 PRE-OPERATIONAL TRIALS AND DEMONSTRATIONS IMPLEMENTATION PROGRAMME IN THE RNAV UT 780 ROUTE AND ITS PARALLEL ROUTE

Activities	Responsible Area	Start Date	Finalization Date	Remarks
1. Regional Agreement for: - RNAV Route parallel to route UT 780; and - RNP 10/50 NM.	GREPECAS	23.10.01	27.10.01	**COMPLETED** During GREPECAS 10 it was achieved a regional agreement in order to implement the programme and the parallel routes.
2. Identification of operational needs.	GREPECAS	23.10.01	27.10.01	**COMPLETED** During the AP/ATM/2 Meeting, Lima, Peru, 14 to 18 May 2001, involved States identified the need to establish a pre-operational RNP 10 Implementation Programme in order to acquire experience in such implementation and in related procedures.
3. Establishment of a Monitoring Agency.	GREPECAS	23.10.01	27.10.01	**COMPLETED** GREPECAS 10 decided that while a regional agreement is achieved the monitoring agency will be in charge of Brasil.
4. Dissemination of Information.	States	June 2002	Permanent activity	Most of the information related to the pre-operational trials and demonstrations plan will ensure the success of the implementation in the target date.
5. Coordination with ATS providers and users.	States	June 2002	Permanent activity	Most of the dissemination of the programme will ensure the success of the implementation in the target date.
6. Study of the impact in the airspace.	States	June 2002	December 2002	The impact in airspace is essential, specially in the issues regarding the use of prohibited and/or restricted areas as well as geographic issues.

Activities	Responsible Area	Start Date	Finalization Date	Remarks
7. Cost-benefit analysis considering: - ATS services providers; and - Users.	States	June 2002	December 2002	Although economical benefits are expected, the expectations are centered in acquire experience in this type of implementation.
8. Establishment of procedures to: a) Approve the RNP 10 for aircraft; and b) RNP10.Operational Approval	a) Appropriate Aeronautical Authority; and b) Operator Status.	June 2002	December 2002	The establishment of the procedures will ensure the success of the implementation in its due time. Reference documentation: • FAA Order 8400.12 A for RNP 10 operation on the North Pacific route System; • CASA Civil Aviation Advisory Publication CAAP RNP 10-1 (FAA Order 8400.12A); • RNP Manual (Doc. 9689).
9. Updated establishment and maintenance of the listed RNP 10 approved aircraft	Monitoring Agency	June 2002	Permanent activity	The timely knowledge of RNP 10 approved aircraft will allow the monitor agency know the progress status of the RNP 10 approval and take pertinent actions.
10. Establishment of a minimal amount of RNP 10 approved aircraft before initiating the trials.	States	June 2002	July 2003	States should define the amount of aircraft that will operate in the RNAV parallel route system that have to be RNP 10 approved before initiating the trials (e.g.: 90% of the amount of aircraft that operate normally in the current airspace that us designated for RNP 10).

Activities	Responsible Area	Start Date	Finalization Date	Remarks
11. Establishment and implementation of: a) The organization who will evaluate safety; b) The programme to evaluate airspace safety; and c) The programme for the recollection of information for the evaluation.	a) GREPECAS b) GREPECAS and the Organization in 11 a). c) States and Organization in 11 a).	TBD TBD 27.10.01	TBD TBD TBD	a) The designated organization should have the necessary experience to carry out the safety assessment in airspace. b) Considering the goal of 5 X 10^{-9} (TLS) in fatal accidents by flight hour, safety assessment is a fundamental element to implement the programme. c) The required basic information to carry out the airspace safety evaluation is included in **Attachment 2**.
12. Amendment to Doc. 7030 SUPPS.	NACC/SAM Regional Offices and States	June 2002	December 2002	A proposal of amendment to Doc. 7030 should be approved in order to apply the RNP 10 NM in routes of the involved FIRs. This amendment is to be circulated by the NACC and SAM Regional Offices for the approval of the ICAO Council.
13. Publication of an AIC that informs the aeronautical community about the introduction of procedures and requirements..	States	June 2002	N/A	
14. To include in the AIP all applicable procedures and requirements.	States	June 2002	N/A	States should include in their corresponding AIPs the minimum requirements and the applicable supplementary procedures.

Activities	Responsible Area	Start Date	Finalization Date	Remarks
15. Notification to the Monitor Agency of: a) RNP 10 Approved Aircraft; b) RNP10 Approved operational operators.	States	June 2002	Permanent activity	Timely notification will ensure the success of the implementation in the planned date.
16. Deadline to have at least, the minimum amount of RNP 10 approved aircraft.	States	N/A	July 2003	If the deadline is not accomplished, the implementation of the programme will be delayed.
17. Progress evaluation of the WGS-84 in the involved FIRs.	NACC and SAM Regional Offices	November 2001	Permanent activity	To accomplish the success in the implementation programme of the GNSS use, involved States should implement the WGS 84.
18. Establishment and implementation of a training programme	States and users	June 2002	July 2003	The establishment of a training programme for CTAs and crew is essential to accomplish the success of the implementation programme
19. Decision to continue and postpone the pre-operational trials	States	N/A	July 2003	The implementation will be continued as long as all involved parts have accomplished the tasks that have been specified in the action plan. The evaluation will be carried out through electronic means.
20. Date of implementation of the RNP 10 NM pre-operational trials and demonstrations.	States	**N/A**	**4/9/03**	

APPENDIX A

Attachment 1 to Appendix A

Basic Tasks of the Monitoring Agency

- The route system is necessary to ensure that the required navigation performance complies with the RNP 10 operations.

- States should establish the procedures for the systematic monitoring of the navigation performance. Such monitoring is to be made periodically and it should inform GREPECAS all obtained results. The TLS of 5x10-9 depends on the fact that the monitoring is complied with.

- All involved States are to maintain records of occurrences and incidents related with the required navigation performance of the aircraft.

The Agency should:

1. Coordinate with operators the monitoring of the navigation performance;

2. Coordinate with States that all operators comply and apply the established procedures, among others, to:

- Flight dispatch;
- Flight Planning;
- Contingency procedures, etc;

3. Coordinate with States who are providers of radar services, the monitoring of the actual navigation performance observed in normal flight operations. A form should be used to collect the data information;

4. Coordinate with States who are providers of radar services at the beginning or at the end of route segments, and who only provide non-radar services for the verification of the navigation performance.

5. To coordinate with the authority responsible of flight standards and in-flight crew inspection, all appropriate procedures for the evaluation of the aircrew and of the operator.

Note 1 It is required to develop detailed procedures that establish all the responsibilities of all parts involved.

6. Collect, verify and distribute all data related to the established navigation specifications.

7. Collect and publish reports, among others:

- Monthly reports on the amount of RNP 10 flight operations;

- Reports on the Gross Navigation Errors (GNEs) observed through radar and complemented with the information given by aircrews, by the operator and/or States, as well as by actions taken. (The GNE is a parameter that should be previously determined by the Agency who carries out the safety assessment);

- Similar reports of the errors observed by radar but obtained through other sources; and

Note 2 Each State involved will establish the requirements for the registration and information by each ATC unit to the Monitoring Agency.

8. It will contribute all participating States with an updated summary of the reports;

9. It will follow-up observed and notified diversions:

- The corresponding ATC unit will inform the pilot of the aircraft concerned that the diversion will be notified to the Monitoring Agency;
- All operators, including those in military aviation, and other ATC units should be informed of observed diversions; and
- Registered States of involved operators should receive a copy of the Reports.

Note 3 The aforementioned information does not pretend to be exhaustive and it should be used as guidance material on the essential elements for the monitoring process. Further information can be obtained in the following documents: Guidance Material for North Atlantic Region (Doc. 001) Manual on Airspace Planning Methodology for the Determination of Separation Minima. (ICAO Doc. 9689) and the Air Traffic Services Planning Manual. (ICAO Doc. 9426).

APPENDIX A

Attachment 2 to Appendix A

Basic Information for Safety Assessment

- States should assess their own system of routes or to compare it with a reference system;

- It is necessary to make an evaluation in order to confirm that the proposed parallel route system can be accomplished with the necessary safety level (TLS) of $5x\ 10^{-9}$ mortal accidents by flight hour by dimension.

- When comparing airspace with the reference system the following has to be included:

1. The collected information, regarding traffic and operation conditions for the particular configuration, in order to compare the specified parameters in the Collision Risk Model (CRM - Reich Model).

Note 1 Examples of CRMs are indicated in the Air Traffic Services Planning Manual (ICAO Doc. 9426), for the Minimum Navigation Performance Specifications (MNPS) in airspace and in the Manual on Airspace Planning Methodology for the Determination of Separation Minima. (ICAO Doc. 9689), for the longitudinal separation of 50 NM.

2. The data will include, among others:

a) Lateral occupation Index;
b) Traffic flying in the same direction;
c) Traffic nominally flying in separated tracks by the minimum distance of lateral separation;
d) Traffic nominally flying at the same flight level; and
e) Aircraft within a longitudinal segment defined for another aircraft;

3. A group of similar criteria to the aforementioned in order to define the occupation in the opposite direction;

4. Reasons of annual growth for a ten-year period;

Note 2 The required parameters should be specified in detail and a form should be given for the collection of data that will be used in the CRM to compare the reference system.

APPENDIX B

Prerequisites for RNP 10 implementation

1. **Identification of the operational need**

- Traffic congestion during “peak” periods and hours;
- Delays and increased flight time;
- Non-direct routes and increase in the distance flown;
- Fuel consumption;
- Aircraft that do not operate at their optimum flight levels;
- Lack of uniformity in longitudinal separation minima;
- Longitudinal separation minima based on time instead of distance;

2. **Impact on airspace**

- Simultaneous operation of aircraft with RNAV equipment and aircraft not RNAV-equipped and/or that do not meet the requirements, and application of the same ATS procedures, especially the longitudinal separation minima;
- Need for better airspace sectorizing;
- Existence of airspaces for special use;
- Need to make airspace more flexible;
- WGS 84 implementation

3. **Impact on Air Traffic Services**

- Normal and contingency ATS procedures;
- Appropriate amendments to the CAR/SAM Regional Supplementary Procedures;
- Training of ATC personnel;
- Reduction of ATC workload;
- Reduction in the number of incidents;
- Increased safety of air operations

4. **Impact on aircraft fleet**

- Aircraft with RNAV equipment that meets the requirements;
- State approval of RNAV equipment

5. **Impact on the crew**

- Normal and contingency operational procedures;
- Crew training

6. **Cost-benefit analysis**

- Air traffic forecasts;
- Reduction of traffic congestion;
- Reduction of delays;
- Reduction of distance flown;
- Fuel and flight time savings;
- Financial feasibility

7. **Impact on civil aviation administrations**

- Implementation planning;
- Establishment of a method to assess airspace safety, considering the desired safety level of 5×10^{-9} established by the Third CAR/SAM RAN Meeting;
- Establishment of a Central Safety Oversight and Surveillance Agency during the pre-operational trial phase to ensure compliance with pre-determined safety criteria;
- Modification of the proposed system parameters after the trial phase, if necessary;
- Operational implementation;
- Maintenance of safety oversight and surveillance.

- END -