RNAV-II
WP/04
18/04/01

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

Second Meeting/workshop of Air Traffic Management (ATM) Authorities and Planners
(Lima, Peru, 14 to 18 May 2001)

Agenda Item 4: Requirements that should be fulfilled for the trials and demonstrations in the RNAV routes between Buenos Aires/Miami, Sao Paulo-Rio de Janeiro/New York and Sao Paulo/Los Angeles.

(Presented by the Secretariat)

Summary

This working paper presents some of the steps, from the ATC perspective that will be necessary to carry out flight trials of RNAV routes Buenos Aires/Miami, Sao Paulo/Los Angeles and Sao Paulo-Rio de Janeiro/New York. In view of the experimental nature of these trials, the items listed are only a draft of the steps required to be covered before the trials, taking into consideration the experience acquired during the implementation of RNAV routes UT/780 and UT795/UT799. The intention of this working paper is to generate and advance the discussions regarding the steps, which will be required to carry out this task.

References:
- GREPECAS Second CNS/ATM/IC Meeting
- First Meeting/workshop of ATM Authorities and Planners
- Doc 9163 – Manual on Required Navigation Performance (RNP)
- Doc 4444 – Rules of the Air and Air Traffic Services
- Doc 9426 – Manual on Air Traffic Services Planning

1. Background

1.1. The Second GREPECAS CNS/ATM/IC Subgroup Meeting, during its deliberations, decided that it would be very fruitful to use the current navigation capacities available in the region and established some minimum requirements that should be complied during the trials and demonstrations.

1.2. The First Meeting/workshop of Air Traffic Management (ATM) Authorities and Planners took notice of the minimum original requirements identified by the CNS/ATM/IC Subgroup to carry out trials and demonstrations in RNAV routes, first phase.

2. Minimum requirements

2.1. The minimum requirements that were examined by the First Meeting/workshop of Air Traffic Management (ATM) Authorities and Planners were as follows:

a. The aircraft should be equipped with RNAV capacity at least.

b. The minimum level assigned should be FL310.

c. If possible, the longitudinal separation standard should be 10 minutes in trail using the Mach number technique.

d. The routes will be assigned a RNP value at a later date

2.2. Each one of the delegates of the States affected by trials and demonstrations routes UT780/UT79/UT799 and IATA, expressed their agreement with such minimum requirements with the exception of the minimum usable level in FL310. On this respect, it was considered necessary to permit the Area Control Centres (ACCs) involved along the route, to assign other lower levels of the upper airspace, as per the corresponding FIR, and hence satisfy the operational requirements of aircraft flying this route.

2.3. As an example, we will mention that for route UT795/UT799 it was concluded that the minimum usable level would be FL290 due to the operational need of some aircraft when they leave Miami or Sao Paulo/Rio de Janeiro.

2.4. Likewise, the meeting should take note that the Required Navigation Performance (RNP) Manual, **Doc 9613**, Chapter 6 and Appendix C shows detailed explanation on the equipment that aircraft should keep on board for RNAV navigation. As per 10-minutes/80 NM longitudinal separations necessary information may be found at **Doc 4444**, Part III, Sections 8.4 and 8.5 in order to apply these separations. Also, orientation guidelines for the application of Mach Number Technique (MNT) may be found in **Doc 9426**, Part II, Section 2, Chapter 2, Air Traffic Services Planning Manual.

3. Status of coordinations between ACCs involved

3.1. It is of utmost importance for these RNAV routes trials and demonstrations that will be carried out in the selected flows, to keep satisfactory ATS speech communications between ACCs responsible for the FIRs where RNAV routes are established.

3.2. It is known by the Secretariat that the situation of ATS speech circuits' reliability of the ACCs in the CAR Region has substantially improved in the latest years, keeping some communications consistent between ATS units in the CAR Region connected to the MEVA network. ATS Speech communications, have considerably improved in the last years in the SAM Region as in they have in the CAR Region. Notwithstanding this, there are some sectors where these communications are not completely satisfactory, although they could be considered acceptable. These deficiencies would be overcome once the digital communications network (REDDIG) is implemented in the SAM Region, which is expected by mid or end 2002.

3.3. **Appendix E** to this working paper shows three tables with the current status of ATS speech circuits of ACCs involved with these RNAV routes, in order to revise them and if necessary, update the information.

4. **Agreements**

4.1. The following agreements are foreseen:

a. ATS Services provider with ATS services provider

b. ATS services providers with representatives of controllers (if such were the case)

c. ATS services providers with the corresponding military authority.

4.2. These trials essentially involve only to ATS services of each one of the FIRs containing demonstrations routes and user who participate in the trials.

4.3. Therefore, to keep a strict control of the project, the meeting shall consider the revision of the letters of operational agreement (LOA) between ACCs involved. This aspect is contemplated under agenda item 5 by means of WP/05.

4.4. Likewise, in order to disseminate these pre-operational trials and demonstrations the meeting shall agree in the drafting of the common AIC model to be used by the States involved, showing the agreements reached, objectives of the project, ATS and airlines procedures, general and military aviation (States´ aircraft), contingency procedures, etc. On the other hand, a common model of AIP Supplement should also be agreed, indicating pre-operational trials and demonstrations start/end date and the description of the RNAV routes where these trials will be carried out. In this connection some models of AIC and AIP Supplement are presented for revision of the meeting.

5. **Procedures**

5.1. The meeting shall consider the development of the following procedures:

a. Definition of coordination points /transfer of responsibilities

b. Assignment of flight level altitudes

c. Coordination and requirements methods

d. Filling out of the flight plan. The trials and demonstrations flights will be identified in the remarks box of the flight plan

e. Minimum longitudinal separation to be used

f. The users shall provide a list of the flights which will be part of the tests

g. The crews will be required to adjust to the flight plan unless adverse weather conditions affect the flight of a route change is required by the ATC

h. The ATC shall not change the route unless it is necessary to ensure the separation with other flight

i. The crews shall comply will ICAO standardized contingency procedures

j. On a daily basis and during the period of the survey, an evaluation form shall be completed in each ATC unit. The surveys shall include a summary of the comments of the operations personnel and authorities. It is also expected that flight crews incorporate to the project, carry out their own evaluation that will be presented to the next evaluation meeting.

5.2. The meeting shall establish the survey period during which the evaluation forms of pre-operational trials and demonstration shown in **Appendix D** will be completed.

6. **Training – General aspects**

6.1. The meeting shall analyze the details related to the training requirements, both for controllers and pilots, establishing in principle that training should be provided at the level of each ACC involved in the routes proposed and of each airline participating in the programme under coordination with IATA.

7. **ATC Units**

7.1. Mandatory training shall be provided in each of the ATC units being affected by these routes. Controllers should have the opportunity to comment on the procedures and propose amendments or changes, if necessary. Training should be standardized and adjusted by each ATC unit, according to their operational needs.

7.2. Likewise, the ATS Evaluation Form (attached in Appendix D) should be adopted and included as part of the training. This would permit controllers to comment on pre-operational trials and demonstrations and provide adequate information.

7.3. Based on the experience acquired during pre-operational trials and demonstrations for RNAV routes UT/780/UT795/UT799, particularly as regards controllers´ training it is deemed necessary that training be provided directly to personnel from other ACCs who, although not directly related to the programme, could be indirectly involved in the same. The issues to be covered for controllers´ training are shown in **Appendix C** to this working paper.

8. **Users – training for pilots**

8.1. Likewise, it is recommended to airlines to develop training material similar to the one in ATC units. Crews should be trained with regard to procedures developed as part of pre-operational trials and demonstrations. Training material between airlines should be similar to and include contingency procedures to be used during events related to adverse meteorological conditions.

8.2. The evaluation form addressed to users also attached as Appendix D should be included as part of the raining. This will permit crews to provide comments on trials and demonstrations project and provide feedback to the group and airlines. Some issues that should be reached by pilots training are shown in Appendix C to this working paper.

9. **Processing and routing of evaluation forms**

9.1. Participating Airlines shall keep in mind the procedures to forward IATA the evaluation forms and trials for processing, and once processed, IATA shall keep in mind the way to submit them to the corresponding ICAO Regional Offices.

9.2. On the other hand, States should use, as far as possible, without modifications, the forms approved by the meeting and foresee the procedures for routing, processing and submission of the information resulting from the forms generated by their own ATC units, and of those presented by other users belonging to general aviation, executive or military, to the corresponding Regional Office.

9.3. Users shall keep in mind that the objective of trials is to evaluate RNAV routes, reason for which the fact of using them implies the commitment of carrying out the corresponding evaluation and present the evaluation form at the destination airport.

9.4. Finally, it is understood that personnel from receiving officers of destination airports that receive forms from other users of the programme, should be instructed as regards routing procedures. The forms to be used by ATC units and users, are shown in Appendix D to this working paper.

10. **Suggested actions**

10.1. The meeting is invited to:

a. Take note on the information provided in this working paper,

b. Carefully revise the aforementioned paragraphs, with a view to establish the procedures, agreements and necessary training, in order to obtain an efficient trials and demonstrations programme.

c. Review Appendices A and B of this working paper, to obtain an AIC and common AIP Supplement, which should be published by all the States involved.

d. Review Appendix C of this working paper and agree on the use by ATC units and users, of the evaluation forms described therein,

e. Review Appendix D of this working paper and agree on the use by ATC units and users, of the evaluation forms described therein, as well as in the period in which the evaluation will be carried out.

f. Review Appendix E of this working paper, and if such were the case, update the ATS speech circuits status between ACCs involved by RNAV routes which have been put into consideration of the meeting.

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Appendix A

AIC Model for the Implementation of RNAV Trial and Demonstration Routes in the CAR/SAM Regions

Telephone: **Fax:** **E-mail:** **Sitatex:** **Telex:**	**GENERAL BUREAU OF CIVIL AERONAUTICS** **AIC** **(STATE)**	**AIC** **DATE**

1 INTRODUCTION

1.1 GREPECAS, with the support of the UNDP/ICAO Regional Project RLA/98/003, through the International Civil Aviation Organization (ICAO), the International Air Transport Association (IATA), and CAR/SAM States/International Organizations, has developed a trial and demonstration programme for the new (list corresponding RNAV route or routes), with the aim to permit the users to allow users to use the avionics already installed in their aircraft, and thus obtain substantial flying time and fuel savings between the selected city pairs, through the use by ATS service providers affected by these routes in both regions of the 10-minute minimum longitudinal separation and/or 80 NM RNAV between aircraft flying at the same level, guaranteed by the use of the Mach number technique (MNT).

1.2 The RNAV Trial and Demonstration Route Implementation Programme includes the following appendices:

Appendix 1 To be determined
Appendix 2 To be determined
Appendix 3 To be determined
ETC.

2 Objectives

2.1 The objective of this AIC is to resume the operational procedures that will support the RNAV CAR/SAM Trials and Demonstrations programme. For more information and details please consult the ICAO NACC and SAM Regional Offices, the IATA Latin American Office or the Civil Aviation Administrations of the States included in these tests.

2.2 A complete version of these RNAV CAR/SAM tests and demonstrations may be found at the following Internet address "http://www.lima.icao.int".

3 RNAV Tests and Demonstration Routes

3.1 Appendix 1 consists in Regional and National graphic and details of the RNAV Tests and Demonstration routes.

3.2 Appendix 2 shows the ATC training plan for these pre-operational trials and demonstrations.

4 ATS Procedures

a) The aircraft that use these routes should be equipped with RNAV equipment.
b) The minimum level of utilization of the RNAV XXXXXXXXXXXX route will be FL XXX and that of route XXXX is FL XXX
c) A minimum separation of 10 minutes/80 NM RNAV will be used between same level aircraft ensured with Mach Number Technique (MNT).
d) For these tests and demonstration flights agreed in paragraph 3 above, the ACCs will carry out ATS coordinations through the coordination means currently established.
e) The aircraft Flight Plan forms used by these pre-operational tests and demonstration RNAV CAR/SAM Routes should complete box No. 10, with letter S (RNAV Equipment); and if necessary, specify what kind of RNAV Equipment is used on board. In Box 15, the Mach number will be included and in Box 18 should be completed indicating the aircraft participated in "RNAV Trial".

5 Airline procedures, General Aviation and State Aviation

5.1 The airlines shall communicate the minimum Procedures/requirements to the dispatchers and crews to fly these RNAV tests and demonstrations in the CAR/SAM Regions.

5.2 The users of general civil aviation and State aircraft (military aviation) shall establish procedures/requirements, to air crews and will make sure that aircraft are RNAV equipped.

6 Contingency procedures

6.1 In case of contingency, these RNAV routes would adjust to contingency plans, as established by this administration (indicate the name of the administration).

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Appendix B

AIP Supplement Model for the Implementation of RNAV Trial and Demonstration Routes in the CAR/SAM Regions

Telephone: **Fax:** **E-mail:** **Sitatex:** **Telex:**	**GENERAL BUREAU OF CIVIL AERONAUTICS** **AIC** **(STATE)**	**Supplement** **DATE**

As of XXXXXX until XXXXX RNAV Trial and Demonstration Route XXXXXXXX (route designator) will be implemented, with the following characteristics:

(Description of the route and graphic)

Appendix C

LIST OF MATTERS FOR AIR TRAFFIC CONTROLLERS AND PILOTS, PRIOR TO IMPLEMENTATION OF RNAV ROUTES AND DEMONSTRATIONS

Air Traffic Controllers training should cover the following issues:

a) General aspects or trials routes;

b) General RNAV and RNP navigation concepts (Doc 9613) (Manual on required navigation performance (RNP);

c) Mach Number Technique management (Doc 9426 (Air Traffic Services Planning Manual);

d) Separation minima applied;

e) Reception and routing of meteorological reports by the pilots in determined routes points;

f) Application of contingency plans;

g) Aspects related with phraseology;

h) Letters of agreement;

i) Coordination; and

j) Filling out and routing of the corresponding evaluation form.

Note: For application of separations purposes based on Mach Number, it is considered important that the air traffic controller have knowledge on speeds for different types of aircraft.

Training of pilots shall comprise the following matters:

a) General aspects of routes and pre-operational trials and demonstrations;

b) Transmission of meteorological reports in pre-determined routes points;

c) Filling out of the corresponding evaluation form.

Appendix D
Evaluation form to be used by Air crews

Long-haul RNAV Routes
Trials and Demonstrations Program
Caribbean and South America ICAO Regions
Crew Evaluation Form

INSTRUCTIONS

Flight Crew - Please fill out one form per flight. Without this input permanent implementation of Long-haul RNAV routes will not be achievable. Upon arrival please hand this form to the flight operations agent or follow your airline's instructions. A complementary questionnaire will be filled out by the controller.
Flight Operations Agent - Please forward this questionnaire to Angel Lucas, IATA Regional Operations Office: e mail - lucasa@iata.org - Telephone 1 305 266 7552 - Fax 1-305-266 7718, or follow your Airline's instructions.
This evaluation program will end ...

1-Date	2-Airline	3-Flight #	4-From	5-To	6-Aircraft Registration	7-Aircraft type

8-Route Evaluated UT410 UT655 UT776 ❑

9-Is the aircraft equipped with FMS ❑ IRS or INS ❑ GPS ❑

10-If unable to obtain the FL proposed in the Flight Plan or requested during flight, please note reasons (e.g. ,not authorized by controller, traffic, weather conditions, aircraft weight, etc.)

11-If unable to proceed with the route approved in the Flight Plan, please note reasons (e.g., not authorized by controller, weather, traffic, etc)

12-Did you send during the flight ACARS messages to the ATC? ❑
If unable to establish proper communication with ATC, please indicate if VHF or HF, position or portion of the route, control center and the possible reasons.

13-Additional comments - Compared to conventional route, do you consider that this route reduces the operational cost of your flight? Yes ❑ No ❑
14-Please add any other comments that can help us to evaluate this route, especially in reference to Safety and Regularity issues.

Thank you for helping in improving the efficiency of the Air Transport in the CAR/SAM Region

Evaluation Form to be used by ACC

RNAV Trials and Demonstrations Programme	**Date:** **From: XXXX To: XXX**
ATS Route Evaluation Form	

1.FIR	**2.ATS Unit**	**3.Ref. N°**
4.Route evaluated	**UT 410**	**UT 655** **UT 776**
5.Route segment evaluated: from…..…….. to…….		

6.Date:	**7. Route entry time:**	**8.Route Exit Time:**
(The date and time should be recorded in UTC)		

9. Aircraft participating								
Operator:	**N° flight/license**	**Type**	**Origin**	**Destination**	**FL Rq.**	**FL Aut.**	**FL Chg a**	**FL Chg occurred in**

10. If aircraft did not flight the requested FL
Due to weather conditions Due to traffic Other causes Specify:

11. Route detour **YES** **NO** **Time and/or detour position:**
If yes, please include:
Due to weather conditions Due to traffic Other causes Specify:

12. Communications difficulties **YES** **NO**	
12A. Controller / Pilot	**12C. Controller / Controller**
VHF HF CPDLC	**ATS Speech Telephone AFTN Other means**
12B. Type of failure	
Interference Out of coverage ATS faulty equipment Onboard faulty equipment	

13. Aditional comments
13A. From the Air Traffic Controller **CTA**
13B. From ATS Unit: **ATS Chief**

Note: For evaluation purposes, this form shall be delivered to the Chief, ATS unit for its Processing and further remittance to the ICAO Regional Office.

Apendix E

Status of ATS speech circuits between ACCs involved in pre-operational trials and demonstrations of RNAV routes Sao Paulo-Río de Janeiro/New York, Sao Paulo/Los Angeles and Buenos Aires/Miami

Sao Paulo-Río de Janeiro/New York Route

ATS Speech Circuit	Condition	Remarks
BRASILIA ACC / BELEN ACC	Satisfactory	
BELEN ACC / PARAMARIBO ACC	Acceptable	SMA HF frequencies used and public switched telephone network as auxiliary channel
PARAMARIBO ACC / GEORGETOWN ACC	Acceptable	SMA HF frequencies and public switched telephone network as auxiliary channel
GEORGETOWN ACC / PIARCO ACC	Acceptable	SMA HF frequencies used and switched public telephone network as auxiliary channel.
PIARCO ACC / SAN JUAN ACC	Satisfactory	
SAN JUAN ACC / NUEVA YORK ACC	Satisfactory	

Sao Paulo/Los Angeles Route

ATS Speech Circuit	Condition	Remarks
BRASILIA ACC / CURITIBA ACC	Satisfactory	
BRASILIA ACC / PORTO VELHO ACC	Satisfactory	
PORTO VELHO ACC / BOGOTA ACC	Satisfactory	
BOGOTA ACC / CENAMER ACC	Satisfactory	
CENAMER ACC / MÉRIDA ACC	Satisfactory	
MÉRIDA ACC / MÉXICO ACC	Satisfactory	
MÉXICO ACC / MAZATLÁN ACC	Satisfactory	
MAZATLAN / LOS ANGELES ACC		

Buenos Aires/Miami Route

ATS Speech Circuit	Condition	Remarks
EZEIZA ACC / CORDOBA ACC	Satisfactory	
CORDOBA ACC / LA PAZ ACC	Satisfactory	
LA PAZ ACC / PORTO VELHO ACC	Satisfactory	
PORTO VELHO ACC / BOGOTA ACC	Satisfactory	
BOGOTA ACC / BARRANQUILLA ACC	Satisfactory	
BARRANQUILLA ACC / KINGSTON ACC	Satisfactory	
KINGSTON ACC / HABANA ACC	Satisfactory	
HABANA ACC / MIAMI ACC	Satisfactory	