INTERNATIONAL CIVIL AVIATION ORGANIZATION

REPORT OF THE

THIRD RLA/00/009 PROJECT COORDINATION MEETING

ON GNSS AUGMENTATION TRIALS

(Río de Janeiro, Brazil, 15 to 17 October 2003)

October 2003

i - Table of Contents i-1

ii - History of the Meeting ii-1
Place and duration of the meeting ii-1
Opening ceremony ii-1
Organization, Officers and Secretariat ii-1
Working language ii-1
Agenda ii-1
Attendance ii-2
Web site ii-2

iii - List of participants iii-1

iv - Acronyms iv-1

REPORT ON AGENDA ITEM 1
Review of the Second Coordination Meeting 1-1

REPORT ON AGENDA ITEM 2
Report on activities carried out to date 2-1

REPORT ON AGENDA ITEM 3
Review of activities scheduled in the project document and their reformulation 3-1

REPORT ON AGENDA ITEM 4
Financial situation of the project 4-1

REPORT ON AGENDA ITEM 5
Other matters 5-1

HISTORY OF THE MEETING

ii.1 PLACE AND DURATION OF THE MEETING

At the invitation of the Airspace Control Department (DECEA) of Brazil, the Third RLA/00/009 Project Coordination Meeting on GNSS Augmentation Trials was held in Rio de Janeiro, Brazil. The meeting commenced on 15 to 17 October 2003.

ii.2 OPENING CEREMONY

Mr. Onofrio Smarrelli addressed the meeting on behalf of ICAO, thanking the Brazilian aeronautical authorities for the arrangements made for the holding of this event, giving a warm welcome to the participants, wishing them all success in the work to be performed by the meeting and highlighing the most important achievements reached by the RLA/00/009 project.

Brig. do Ar Ramón Borges Cardozo, DECEA´s Vice Diretor de Planejamento, welcomed all participants on behalf of the government of Brazil, and expressed his pleasure in hosting this event, emphasizing the importance of GNSS augmentation trials for the definition of the CAR/SAM satellite navigation system, as well as the work carried out by Brazil in relation with the development of SBAS augmentation. In addition, he wished to the meeting success on its deliberations and declared inaugurated the event.

ii.3 ORGANIZATION, OFFICERS AND SECRETARIAT

The meeting was chaired by Mr. Luis Rossi. Mr. Onofrio Smarrelli, SAM Regional CNS Officer, acted as Secretary of the Meeting.

ii.4 WORKING LANGUAGES

The working languages of the meeting were Spanish and English. The documentation and the Report of the Meeting were issued in English and Spanish.

ii.5 AGENDA

Agenda Item 1: Review of the Second Coordination Meeting

Agenda Item 2: Report on activities carried out to date

Agenda Item 3: Review of activities scheduled in the project document and their reformulation

Agenda Item 4: Financial situation of the project

Agenda Item 5: Other matters

ii.6 ATTENDANCE

The Meeting was attended by Argentina, Brazil, Chile, United States and COCESNA. The list of participants is attached to this part of the report.

ii.7 WEB SITE

The documentation presented to the meeting including the Summary of Discussions and Conclusions are available at http://www.lima.icao.int/.

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LIST OF ACRONYMS

CSTB	CAR/SAM Test Bed
DECEA	Departamento de Controle do Espaço Aéreo
DEPRD	Deputy Regional Director
FAA	Federal Aviation Administration
GEIV	Grupo Especial Inspección en Vuelo
GEO	Geostationary Satellite
GIVE	Grid Ionospheric Vertical Error
GNSS	Global Navigation Satellite Service
GPS	Global Position System
IGP	Ionosheric Grid Point
NPA	Non Precision Approach
NTSB	National Test Bed
RAAC	Reunión de Autoridad de Aviación Civil
RTCA	Radio Technical Commission for Aeronautical
SAM	South America
SBAS	Satellite Base Augmentation System
TRS	Test Bed Reference Station
TMS	Test Bed Master Station
UDRE	User Differential Range Order
WAAS	Wide Area Augmentation System

Agenda Item 1: Review of the Second Coordination Meeting

1.1 The Meeting took note of the information related with the results of the second coordination meeting, and examined the status of the conclusions formulated thence. The result of the conclusions analyses and their status of validity is presented as **Appendix A** to this Agenda Item.

APPENDIX A

STATUS OF CONCLUSIONS FORMULATED DURING THE SECOND RLA/00/009 PROJECT COORDINATION MEETING

CONCLUSION	TITTLE	CONTENT	STATUS	REMARKS
2/1	Recording and analysis of data obtained by the reference stations	That, with the aim of guaranteeing the collection and analysis of the data obtained by the reference stations, consideration be given to the following: a) a group of States conformed by Brazil, Colombia and United States will analyse the data obtained by the TRS of the CSTB, and will produce and deliver quarterly reports, starting on October 2002, to the States participating in the project, to obtain information on the result of the trials; and b) the Secretariat will present and deliver to the States participants in the project, a detailed procedure of execution of TRS data acquisition by 1 October 1 2002.	**Pending**	GPS data recording continues from the reference stations, under the same conditions as set in the second coordination meeting. Higher ionosphere variation occurs from October to March, therefore, it is important to guarantee data recording. Until the CSTB is connected to the REDDIG, data collection procedure continues as before (Appendix B to this part of the report). As regards item a) of this conclusion, for the time being the analyses will be made by United States, until Brazil and Colombia count with trained personnel to carry them out. Item b) has been concluded. Appendix B to this part of the report includes a copy of the procedure carried out at specified date.

CONCLUSION	TITTLE	CONTENT	STATUS	REMARKS
2/2	Extension of trials under RLA/00/009 project	That: a) the project, recognizing the need to carry out studies to perform a ionosphere study to develop the corresponding suitable modeling of the same for the CAR/SAM regions aimed at implementing trials for air operations requiring vertical guidance, request to Brazil to document and present to ICAO not later than 6 September 2002, a detailed proposal on this matter indicating scope of the activities, resources and other pertinent matters related with the activities sharing among the project parties; and b) ICAO in considering the Brazilian proposal in coordination with the other project parties, determine the most adequate course of action to study the feasibility to implement this new activity as part of the RLA/00/009 project schedule.	*Pending*	It has been agreed that the project will only make trials for GNSS augmentation non precision (NPA) approach procedures. The analysis of the scintillation phenomenon in GPS data for NPA procedures, as well as the establishment of a valid CAR/SAM ionospheric model to implement vertical guidance procedures, will be executed by Brazil outside the project's framework. Brazil, to be able to conclude this task, has made an agreement with the Aeronautical Technical Centre (CTA), and its financing will be sought through the Casimiro Montenegro Filho Fundation. RLA/00/009 has no funds to carry out this task, and States have indicated their intention of not providing further funds to the project for this task, for the time being. This task will have to be considered within a new project, which could be an extension of RLA/00/009.

CONCLUSION	TITTLE	CONTENT	STATUS	REMARKS
2/3	States contributions to the RLA/00/09 project	In order to proceed with the activities of the Project, the States with pending contributions should make all the necessary efforts to make effective the corresponding deposits before the end of 2002.	*Valid*	See report on Agenda Item 4.

APPENDIX B

GPS DATA COLLECTION AND RECORDING PROCEDURES AT TRS

To comply with Conclusion 2/1 of the Second Coordination Meeting of RLA/00/009 Project (GNSS regional augmentation trials), please find below data collection procedure.

Stations that can analyze GPS data obtained by the TRS

- William J. Hughes Technical Center, Atlantic City International Airport, FAA, United States
- Master Station in Rio de Janeiro, Brazil
- TRS in Bogota, Colombia
- TRS in Lima, Peru

These stations have the hardware and software necessary to analyze GPS data obtained by the TRS.

Bolivia, Colombia and COCESNA TRS

Since these stations do not have communications links with the respective master stations, the GPS information collected by the TRS must be locally recorded in a CD.

The recording has to be on a 24-hour basis. Particular attention should be given to the recording during the period from October until end of March, when there is greater ionosphere activity.

It will be appreciated that each of these States send the data recorded to the ICAO South American Office in Lima at the end of each month. The information would have to arrive within the first five days of the next month of the recording.

Please compress the information so as to reduce the quantity of CDs necessary. The recording of one day of information from the TRS amounts to approximately 30Mbits.

Argentina, Chile and Peru TRS

These TRS are physically connected to their respective mater station (Santiago, Chile). This station has a communications link with the FAA Technical Center in Atlantic City.

This centre records the information permanently. The information recorded can be accessed and downloaded from the web page: www.nstb.tc.faa.gov .

To guarantee continuous data recording, it is recommended to also register the information in a CD (same procedure as indicated in above paragraph) in addition to the information that would be recording Atlantic City. Likewise, it would be recommendable to daily monitor the status of the communications circuits between the TRS and the master station, and from the master station to the Atlantic City Technical Center.

The aforementioned web page can be checked upon to verify whether the data is being registered.

Agenda Item 2: Report on activities carried out to date

2.1 The Meeting took note of the activities carried out since the project's second coordination meeting, until the date of this meeting. The activities were oriented towards the communications platform of the augmentation system, data collection from the reference stations, and flight trials.

2.2 As regards the communications platform, the Meeting took note of the activities held in each of the reference stations, such as the interfaces connected to the South American Digital Network (REDDIG) to host the information from the reference stations. In addition, the Meeting was informed that REDDIG had started to operate at the end of September 2003 with ATS speech services and the AFTN, and that it was expected that by the end of November 2003, the augmentation system would start operating though REDDIG. **Appendix A** to this Agenda Item presents the activities carried out at each of the States involved.

2.3 The Meeting noted the activities at each of the reference station with respect to data collection, specifying the manner how the task had been carried out (see Appendix A). In addition, the delegate from united States presented the results of the analysis made to the data collected by the FAA technological centre in Atlantic City.

2.4 The data collection has permitted to evaluate the operation of the reference station components; GPS receivers with problems have been identified and substituted, as was the case of the Bogota and La Paz reference stations. The validated data will be of great use to the scientific community studying ionospheric phenomena, specifically in determining GIVE (Grid Ionospheric Vertical Error) values. The Meeting highlighted the importance of continuing to record the data from the reference stations, so as to contribute with the ionosphere studies.

2.5 In addition, the Meeting was informed that the ionosphere studies basically oriented towards the scintillation phenomenon, as well as on the establishment of a regional ionospheric model, continued, and that to this end a cooperation agreement had been reached between DECEA (Brasil) and CTA (Aeronautical Technical Centre), with the aim of developing a research programme whose tasks would be distributed and administrated by a technical group. The results of its work would be informed to the research supervision group. The financial contribution necessary to carry out these investigations would be assumed by a foundation.

2.6 Brazil invited the States of the Region to participate in the regional ionosphere investigation and requested a greater support from the FAA (United States) as regards aeronautical technical personnel and ionosphere specialists training.

2.7 Also, the Meeting took note of the flight trials made by Brazil, the difficulties encountered for their execution and the limitations presented in the analysis of the data collected. In addition, Brazil presented the Meeting with a new flight trial schedule to be carried out during the first quarter of 2004, in said country. As consequence of the experience gained, Brazil indicated that it would be available to provide support to the CAR/SAM Regions as regards flight trials.

2.8 The Meeting took note of the trials in Brazil for the initial verification of the existing correlation between the HF communications systems and the GPS signals upon ionospheric phenomena.

2.9 The Meeting examined and evaluated the project's annual report, and their results are shown in **Appendix B** to this part of the report.

APPENDIX A

ACTIVITIES CARRIED OUT BY PROJECT PARTICIPATING STATES

Argentina

The TRS station is installed and operational since December 2001. Communications with the Chilean Master Station was completed in March 2002. Since the most important activity carried out was data collection from the TRS, this activity has been carried out in a continuous manner and all information recorded is in the FAA's data base.

Bolivia

Since November 2002, upon not having available a communications line with the Chilean master station, all data obtained in the TRS station were recorded in CD, sent on a monthly basis to the ICAO Regional Office in Lima and then sent to the FAA for processing. In addition, some of these CDs were sent to Colombia (June 2003) since a processing unit was available and in operation. From the analyses of the data processed by the FAA, it was determined that the Millenium GPS receiver was having problems and the FAA sent a new GPS receiver.

Brazil

Brazil equipped a Hawker 800 property of the GEIV with a flight trial console with capacity to collect GPS L1, L2 and WAAS data. Since April to October 2003, 40 flight trial hours have been carried out. Flight trials consisted in approach procedures to the Santos Dumont airport (Rio de Janeiro), to verify precision at the approach modes, and in 40-mile square flights at 31.000 feet after sunset hours, to see the ionosphere behaviour at its worst condition. Important initial studies on the ionosphere in the equatorial area and its impact on GPS signals have been effected.

Chile

The information obtained by the Chilean reference stations is continuously transmitted for storage and processing, since 1998, to the FAA NSTB facilities at the Atlantic City Technical Centre, through a 64 Kbits/Sec direct digital circuit established between Santiago and Atlantic City. The connection of the master station to REDDIG will be implemented by the end of November.

Colombia

Colombia, since June 2003, has started operation of a processing unit of GPS data obtained by the reference stations and, for this purpose, uses GPS Solution Software to be in the capacity of obtaining archives such as PDF Site Name Ext (Position Domain Navigation Error), SV Tatus Range and SV Domain, as well as geostationary satellite event data archives.

In addition, has developed a programme in C language, which statistically analyzes the data in the PDF output of the PDF Site Name ext archive. The programme's objective is to provide availability, integrity, continuity and coverage values for NPA operations and APV/1 and APV/2 approaches. A technical and operational guidance manual for the RLA/00/009 CAR/SAM Test Bed has also been elaborated. A Colombian network VSAT station has been installed in Tegucigalpa, Honduras, to be able to take the information from the Honduras TRS to Bogota, and from Bogota to Rio de Janeiro, via REDDIG. The link with the Brazilian master station is pending. It is expected to be implemented and operational through REDDIG at the end of November 2003. The GPS data recorded from the reference station are uploaded in the Colombian aeronautical administration's web page, with a weekly updating.

Panama

This reference station is part of the United States satellite augmentation trial platform (NTSB). The information of the data is recorded directly at the Atlantic City Technical Centre's NSTB.

Peru

The TRS station is installed and operational since December 2001; communications with the Chilean master station was completed in the beginning of 2002. Since the most important activity carried out was data collection from the TRS, this has been continuously carried out and all information recorded is in the FAA's data base.

Likewise, the Peruvian administration has purchased a work station and installed the GPS Solution data processor, provided by the FAA. The unit is still unable to process the information in its totality and currently, technical personnel is making coordinations with FAA for its operation.

COCESNA

COCECNA records since 2002 and in CDs the information obtained in its reference station, and sends the information to the FAA Atlantic City Technical Centre.

During the data analysis, it was determined that the station had a failure and the FAA replaced the GPS receiver and the processing unit, but the fault continues. Coordinations between FAA and COCESNA continue, with the aim of solving the problem.

APPENDIX B

ANNUAL REPORT UNDP/ICAO RLA/00/009 PROJECT
Regional GNSS augmentation trials

Basic Information on the Project (provided by the project management)

Number and title of the project:	RLA/00/009–Regional GNSS augmentation trials
Designated institution:	ICAO
Project initiation date:	
Originally planned:	July 2001
Effective:	July 2001
Project termination date:	
Originally planned:	June 2004
Effective:	
Total budget (Dollars):	
Initial amount:	229,900
Last approved revision:	188,936
Period covered by the report:	August 2002 – September 2003

PART I: NUMERIC EVALUATION

Please evaluate pertinence and performance of the programme or project, using the following scale:

1 – Highly satisfactory
2 – Satisfactory
3 – Not satisfactory, with some positive elements
4 – Not satisfactory
X – Does not apply

Please indicate your answers in the column corresponding to your function in the programme or project.

SUBSTANTIVE APPROACH	ICAO	ARG	BOL	BRA	CHI	COL	ECU	EE.UU.	PAN	PER	VEN	COCESNA	AVERAGE
1. How do you evaluate the level of pertinence of the programme or project in relation to the development priorities of the country?	X	2		1	2			2				2	
2. Given the programme or project objectives, is support provided to pertinent institutions?	2	2		2	2			2				2	
3. Using the following indicators, evaluate the product contribution to the achievement of the immediate objectives a/:													
Indicator #1 GREPECAS will count with the necessary information that will allow the establishment of an operational model of a system augmentation, type GNSS (SBAS / GBAS) in the CAR/SAM regions.	2	1		3	2			2				2	
Indicator # 2 Project participant States will have qualified personnel to analyze the installation of the augmentation systems in support to the navigation systems.	2	2		3	3			2				2	
4. Evaluate achievement of desired products.	2	2		3	2			2				2	
5. Are management mechanisms of the programme or project adequate?	2	2		3	2			3				2	

SUBSTANTIVE APPROACH	ICAO	ARG	BOL	BRA	CHI	COL	ECU	EE.UU.	PAN	PER	VEN	COCESNA	AVERAGE
6. Are programme or project resources sufficient (financial, physical and human) in respect to:													
a) quantity?	3	2		3	3			2				3	
b) quality?	2	2		2	2			2				2	
7. Are programme or project resources being used efficiently to produce aimed results?	2	2		2	2			2				2	
8. Is the programme or project effective in function of costs, in comparison with similar programme or projects?	2	2		2	2			2				2	
9. Based in the work plan, how would you evaluate the opportunity of the programme or project regarding:													
a. achievement of initial products and results?	2	2		3	2			2				2	
b. delivery of supplies?	3	2		3	3			2				3	
GLOBAL EVALUTION OF THE PROGRAMME OR PROJECT	2	2		3	2			2				2	

Explain the basis of your grading, which does not have to limit itself exclusively to the relevance and performance and cannot coincide with the above grading. With regard to the last year of the programme or project, a possible programme or project success estimate must be included in the global grading, as well as of its relevance and performance.

ICAO: **From the data collection from the reference stations and their subsequent analysis, importance conclusions were obtained, which will permit having the information necessary to start the study of an operational model for en route and NPA operations in the CAR/SAM Regions through a GNSS SBAS augmentation system.**

Brazil: **A number of difficulties, mainly related to personnel qualification, research funding and equipment integration prevented the achievement of practical results as planned.**

United States: **It is unfortunate that the decision to wait on REDDIG caused many delays and really accomplished nothing in 2003. However, our project identified the ionosphere issue which is imperative to the future operational GNSS architecture that will be decided upon. We need to get TRS online as soon as possible, and conduct tests for reporting at GREPECAS ATM/CNS/SG. Then look to end the project in mid 2004.**

PART II: DESCRIPTIVE EVALUATION

1. Which are the principal achievements of the programme or project in relation to the expected results during the period being evaluated? If possible, please include an evaluation of possible effects, sustainability, and contribution to capacity development.

ICAO:

- **Data collection and processing from the reference stations.**
- **Implementation of data processing stations in Colombia and Peru.**
- **Important conclusions as result of first trials, which permitted defining that through augmentation platform installed there would be support, in principle, of en route and NPA operations. Study of scintillation phenomenon in the ionosphere being carried out in Brazil would be defining additional considerations, if the case, that would be supporting aforementioned operations. To verify operations with APV vertical guidance, a ionosphere model study is being carried out to be used to determine an operational solution for the use of SBAS for vertical guidance.**

2. Which are the questions and principal problems that influence the achievement of the programme or project results?

ICAO:

- **Implementation of satellite ground station has not occurred due to its high cost.**
- **Delay in REDDIG operation.**
- **TRS unconnected to REDDIG node.**

Brazil:

- **Lack of training with data analysis tools.**

3. How should these questions or problems be solved? Please provide a detailed explanation of the recommended action or actions. Specify who should be responsible for these actions. Indicate also a provisional timetable and necessary resources.

ICAO:

- **SBAS augmentation will be carried out as long as satellite ground station is implemented. If ground station is not installed, augmentation trials could be made via VHF communications systems.**
- **That States that have not physically connected the TRS to the REDDIG node do so soonest.**

Brazil:

- **Personnel involved in some of the research development tasks should be trained on GNSS data analysis tools.**

4. What new happenings could probably affect the achievement of the programme or project results? What do you recommend to be prepared for these happenings?

ICAO: To be able to carry out vertical guidance approach (APV) it is necessary to complete the ionosphere mathematical model. Without this mathematical model to be installed in the master station, no trials can be carried out.

5. Which is the opinion of States regarding the programme or project?

ICAO: The project specified CAT 1 approach trials; these will not be able to be made due to limitations in the systems. The augmentation system could support vertical guidance approach operations since corrections to the ionosphere model have been developed.

6. Up to date, what lessons (positive or negative) can be pointed out from the programme or project experience?

ICAO:

- **States involved in the project have gained knowledge and experience as regards GNSS augmentation systems.**
- **The GNSS augmentation platform currently installed would be supporting trials en route operations and NPA approach. Vertical guidance operations require the ionosphere model currently under study.**

United States:

- **Need to be more aggressive and push project schedules with accountable parties.**
- **Do not even need VHF for trials. Use TRS data for SBAS performance and aircraft flyability for proof of concept.**

7. Do you propose any substantial revision to the project document? If yes, which are these revisions= Please indicate justifications.

ICAO: The project's first phase evaluation has been satisfactory. Conclusions formulated during the second coordination meeting have been executed.

8. Provide any other information that could support or give clarity to your programme or project evaluation. You may include the annexes that you consider necessary.

ICAO: Please see answers 4 and 5. In addition, if satellite ground station is not implemented, on flight trials would have to be made via VHF communications systems.

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For Bolivia: Name: Position: Date: Signature:
For Brazil: Name: Alvaro Moreira Pequeno Position: Chief, CNS/ATM Commission Date: 17 October 2003 Signature:
For Chile: Name: Luis A. Rossi Position: Executive, CNS/ATM Project Date: 16 October 2003 Signature:
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For Venezuela: Name: Position: Date: Signature:
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For ICAO: Name: Position: Date: Signature:
For UNDP Name: Position: Date: Signature:

PART III: Summary chart of the programme or project

Programme or project title and number:	GNSS Regional Augmentation Trial	Management dispositions:	
Designed institution:	ICAO	Covered period:	July 2001/June 2004

GLOBAL EVALUATION

During the project's second year, its main activities have been the data collection from the TRS, and their processing. In addition, some States of the Region have implemented processing stations and are currently in the capacity of analyzing the data collected. Studies on the ionosphere continue, and it s expected that during the coordination meeting, news of the first results can be obtained.

FINANCIAL SUMMARY			
Funds Source	Budget (Thousand Dollars)	Espenditures (Thousand Dollars)	Implementation Rate (%)
Participation in funding of expenditures: Governments of:			
Argentina, Bolivia, Colombia, Ecuador, Panama, Peru, Venezuela and COCESNA.	30,0 (2001)	30,0 (2001)	N/A
	48,4 (2002)	48,4 (2002)	N/A
	53,7 (2003)	2,0	3.7 %
	56.8 (2004)		N/A

SUMMARY OF RESULTS			
Programme support objectives or immediate objectives		**Indicators**	**Achievements**
Obj. 1	Develop a test and evaluation plan on the technical and operational benefits of the U.S. FAA WAAS in the Caribbean and South American regions (CAR/SAM), so as to assist in the establishment of the satellite based augmentation systems operational model being developed by the GREPECAS CNS/ATM implementation coordination subgroup.	**Indicator #1** GREPECAS will count with the necessary information that will allow the establishment of an operational model of a system augmentation, type GNSS (SBAS / GBAS) in the CAR/SAM regions. **Indicator #2** Project participant States will have qualified personnel to analyze the installation of the augmentation systems in support to the navigation systems.	To date, important conclusions have been obtained to help define an initial operational model for a GNSS augmentation system in the CAR/SAM Regions. Participant States have been trained through the realization of two of the three foreseen courses. They have acquired the knowledge for the TRS installation. They have achieved familiarization with the initial tests of data collection in ground and air. They have become familiar with the processing of the data collected.

Annual goals	Products achievement	Proposed products goals for next year
Objetive 1 Develop a test and evaluation plan on the technical and operational benefits of the U.S. FAA WAAS in the Caribbean and South American regions (CAR/SAM), so as to assist in the establishment of the satellite bed augmentation systems operational model being developed by the GREPECAS CNS/ATM implementation coordination subgroup.		
1.1. CAR/SAM test bed operational test and evaluation plan developed and approved.	The tests plans elaborated so far and approved by the participant States consisted on the collection of data in ground and air to analyze the influence of these with the ionosphere for en route and NPA operative procedures.	To finish the elaboration of the remaining plans.
1.2 GPS approach procedures for test flight to exercise the WAAS component in each participating State at one airport.	Not yet carried out.	Their realization is expected in March 2004.
1.3 Development and refinement of operational standards and procedures for use and approval of satellite-based navigation systems.	ICAO effective regulations will be used.	ICAO effective regulations will be used.
1.4 Preparation for test and evaluation data collection and analysis in each participating State (Equipment Installation Site Survey and Installation Plan.	Carried out. A plan for data collection at TRS stations has been prepared.	It is expected that by the end of November 2003 the communications platform is concluded through REDDIG.

Annual goals	Products achievement	Proposed products goals for next year
Objetive 1 Develop a test and evaluation plan on the technical and operational benefits of the U.S. FAA WAAS in the Caribbean and South American regions (CAR/SAM), so as to assist in the establishment of the satellite bed augmentation systems operational model being developed by the GREPECAS CNS/ATM implementation coordination subgroup.		
1.5 Regional Flight Test Plan (Phase 1) developed for testing and evaluation of cooperative concepts and architecture fo an integrated satellite navigation system.		Flight tests for the verification of the SBAS augmentation. For this purpose Brazilian and Colombian flight inspection aircraft will be used.
1.6 Completed Regional Flight Test Plan.		It is expected that the flight tests will conclude by end of May 2004.
1.7 Regional Flight Test Report (Phase 3) to include each sub-region test bed airborne segment analysis and reports for the regional tests.		It is expected that the report will be finished by June 2004.
1.8 State Flight Test Plan developed (Phase 4) for testing and verification of satellite navigation concepts in each participating State.		Flight tests for the verification of SBAS augmentation will depend of ground satellite station installation. Augmentation trials will be verified via VHF communications systems.

Annual goals	Products achievement	Proposed products goals for next year
Objetive 1 Develop a test and evaluation plan on the technical and operational benefits of the U.S. FAA WAAS in the Caribbean and South American regions (CAR/SAM), so as to assist in the establishment of the satellite bed augmentation systems operational model being developed by the GREPECAS CNS/ATM implementation coordination subgroup.		
1.9 Preparation for testing and evaluation of the performance of the test bed for all phases of flight down to and including CAT I precision approaches. State Flight Test Plan.	In accordance with the first results of the tests carried out to-date, the type of tests that the project will be able to embrace will be for en route and NPA operations. No CAT 1 tests will be carried out.	
1.10 Completed State Flight Test Plan.		Its completion is expected by May 2004.
1.11 State Flight Test Report (Phase 6) completed to include each sub-region test bed airborne segment analysis and reports at the State level.		Its completion is expected by June 2004.
1.12 State Operational Implementation Strategy/Plan (Phase 7). Reduction of the risks and removal of the barriers involved with a future implementation of satellite navigation in the CAR/SAM regions.		This plan will be included in the Project final report.

Annual goals	Products achievement	Proposed products goals for next year
Objetive 1 Develop a test and evaluation plan on the technical and operational benefits of the U.S. FAA WAAS in the Caribbean and South American regions (CAR/SAM), so as to assist in the establishment of the satellite bed augmentation systems operational model being developed by the GREPECAS CNS/ATM implementation coordination subgroup.		
1.13 State/Regional Training Plan Technical and operational experience and training provided to facilitate the implementation of a satellite navigation system.		The last course, entitled Operational Requirements, is foreseen for June 2004.
1.14 State/Regional Cost Benefits Analysis. Provision of data and information for the development of a verifiable cost/benefit analysis.		This analysis will begin in June 2004, and is expected to be finished in 15 days.
1.15 State/Regional Satellite Navigation Architecture. (Hardware, Software/ Communications) Provision of convincing technical proof of concept to initiate funding to start the implementation of satellite navigation in the CAR/SAM regions.		This will entirely depend on the results of the tests.
1.16 Operational training programmes available for all participants in the test program. (Training support as requested).		June 2004

Agenda Item 3: Review of activities scheduled in the project document and their reformulation

3.1 The Meeting was informed that, due to the delay in the South American Digital Network (REDDIG) implementation, the CSTB communications platform had not been able to operate through this Network.

3.2 The Meeting took note that REDDIG started operation on 30 September 2003, with ATS speech services and AFTN and that, by the end of November 2003, the GNSS augmentation system would operate through REDDIG, as long as States complete the necessary physical connections between the reference station and the REDDIG node.

3.3 Once the CSTB communications platform is established through REDDIG, the data from the reference stations would be collected and analyzed automatically at the FAA (United States) technical centre in Atlantic City, through the currently existing Santiago-Atlantic City circuit, and the Rio de Janeiro-Atlantic City circuit, whose implementation would be ready by the end of November 2003.

3.4 The Meeting considered that, to carry out the flight trials foreseen in the project, augmentation information would be disseminated via the VHF communications system, since the implementation of the satellite ground station, as well as augmentation dissemination through GEO, would not be implemented due to their high cost. Therefore, the trials would be executed within the VHF communications system radio coverage.

3.5 The Meeting also considered that the flight trials would be starting in May, using, in this respect, Brazilian and Colombian flight inspection aircrafts equipped with appropriate consoles for augmentation verification, as in the project document's specifications.

3.6 The Meeting noted that Brazil would be carrying out flight trials in Argentina, Bolivia, Chile, Peru and Brazil, and that Colombia would be doing so in Honduras, Panama, Venezuela, Ecuador and Colombia. During these flight trials, NPA operational procedures previously designed for each of the mentioned sites would be carried out, as well as flight trials in a pre-determined area and height, at times after the sun set, to record GPS data in adverse ionospheric conditions. The flight trials procedures will be previously coordinated between the unit to make the flight trials with the corresponding States, prior ICAO knowledge. In addition, the Meeting took consideration that during these flight trials, and as long as it were necessary, there would be FAA support. Therefore, the Meeting formulated the following conclusion:

Conclusion 3/1 Execution of flight trials

That:

a) Brazil and Colombia draft a schedule for the execution of the flight trials specified in paragraph 3.6 to this part of the Report, considering as an initial tentative date for these to be the second week of May 2004, and that it be sent to the ICAO Regional Office at the end of November 2003; and

b) States where flight trials will be made, coordinate with the corresponding flight trial units (Brazil and Colombia) the procedures to be carried out, as well as all activities to be previously made on the site.

3.7 The Meeting, taking into consideration that the approach to be given to the project, on the basis of the results from the first trials, would be oriented towards NPA navigation operations, considered the need to start studies for a cost-benefit analysis in this regard.

3.8 For the cost-benefit analysis, the Meeting considered the need that the FAA support the project in determining a minimum configuration for a WAAS augmentation system guaranteeing NPA procedure operations in the CAR/SAM Regions. As support material, the minimum amount of reference, master and satellite link stations required would be necessary to be known, as well as their costs.

3.9 In addition, the Meeting considered that, for the cost-benefit analysis, it would be necessary that the FAA also consider the technical feasibility of another scenario, composed by the minimum number of reference stations necessary in the area under analysis to be connected to the United States WAAS system master stations, with the aim of having a widened WAAS satisfying the NPA requirements taken into consideration. Therefore, the Meeting agreed to the following Conclusion:

Conclusion 3/2 Initial considerations for a cost-benefit analysis

That the FAA (United States) provide support to RLA/00/009 project for a cost-benefit analysis on NPA procedures in the CAR/SAM Regions, taking into account the following considerations:

a) minimum WAAS augmentation platform (reference, master and satellite link stations), and their cost; and

b) technical feasibility for a WAAS extension in the CAR/SAM Regions, plus the requirements necessary for said implementation, and its cost.

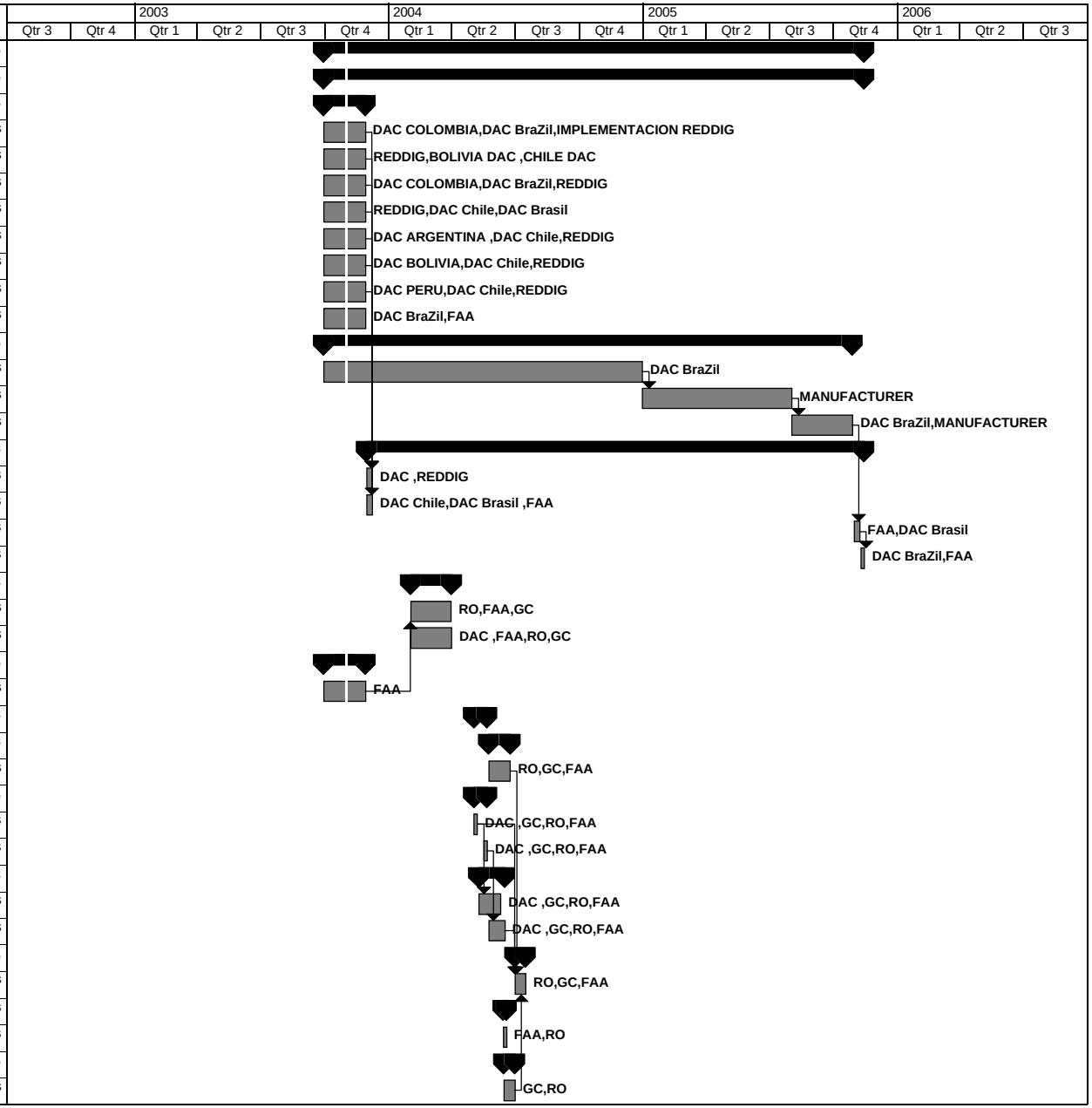
3.10 The Meeting, upon analyzing the pending training programme, considered that it was necessary that the objective, as well as the contents of the last forecast course be defined, and, in this respect, agreed that the project technical coordinator make the necessary coordinations with the FAA, prior coordination with contracting States.

3.11 **Appendix A** to this Agenda Item presents the schedule of activities to be carried out until the end of the project, which was analyzed and approved during the Meeting.

Appendix A to Report on Agenda Item 3

RLA/00/009 - GNSS Augmentation Regional Trials
ACTIVITITIES TO BE CARRIED OUT FOR EXECUTION OF SBAS AUGMENTATION TRIALS

ID	Task Name	Duration
1	**RLA/00/009 Implementation**	**555 days**
2	**WAAS Platform Installation**	**555 days**
3	**Communications links**	**44 days**
4	Bogota Río REDDIG	44 days
5	La Paz Santiago REDDIG	44 days
6	Honduras Rio	44 days
7	Rio Santiago	44 days
8	Buenos Aires Santiago REDDIG	44 days
9	La Paz Santiago REDDIG	44 days
10	Lima Santiago REDDIG	44 days
11	Rio de Janeiro Atlantic City	44 days
12	**Ground satellite station**	**544 days**
13	Purchase	328 days
14	Manufacture	153 days
15	Activation and operation	63 days
16	**WAAS Platform Activation**	**511 days**
17	TRS TMS trials	6 days
18	TMS TMS Trials	6 days
19	TMS UP LINK Trials	6 days
20	UP Link Trials	3 days
21	**Trial Operational Plan**	**43 days**
22	Regional plan	42 days
23	State plan	43 days
24	**Service level to be verified**	**44 days**
25	Study level en route service	44 days
26	**Regional Trial**	**15 days**
29	**Regional Trial Report**	**23 days**
30	Report elaboration	23 days
31	**States Trial**	**15 days**
32	Trials State 1	5 days
33	Trials State 2	5 days
34	**States Trial Report**	**27 days**
35	Report elaboration State 1	23 days
36	Report elaboration State 2	17 days
37	**Final Report**	**11 days**
38	Final report elaboration	11 days
39	**Training**	**5 days**
40	Holding of Course on Procedures	5 days
41	**Cost-benefit Analysis**	**12 days**
42	Cost-benefit study	12 days



Agenda Item 4: Financial situation of the project

4.1 The Meeting was informed of the project's financial situation. The original budget, approved on 29 June 2001, amounted to USD 229,900. Through Revision C, approved on 3 July 2002, the budget was adjusted to USD 188,936, establishing a cost-sharing payment schedule per State of USD 23,617.

4.2 The Meeting took note of RLA/00/009 project's financial situation, shown in **Appendix A** to this Agenda Item.

APPENDIX A

REGISTER OF COST-SHARING CONTRIBUTIONS

STATE	2001		2002		2003		TOTAL		
	Contrib.	**Deposit**	Contrib.	**Deposit**	Contrib.	**Deposit**	Contrib.	**Deposit**	Balance
ARG	13,673	**13,673**	6,362	**6,362**	3,582		23,617	**20,035**	3,582
BOL	13,673	DGAC 30% **4,102** AASANA 70% **9,571**	6,362	DGAC 30% **1,041** AASANA 70% **4,460**	3,582		23,617	**19,173**	4,444
COL	13,673	**13,673**	6,362	**6,362**	3,582		23,617	**20,035**	3,582
ECU	13,673	**13,673**	6,362	**6,362**	3,582		23,617	**20,125**	3,492
PAN	13,673	**13,673**	6,362		3,582		23,617	**13,763**	9,944
PER	13,673	**13,673**	6,362		3,582		23,617	**13,673**	9,944
VEN	13,673	**13,673**	6,362	**6,362**	3,582	**3,582**	23,617	**23,617**	0
COCESNA	13,673	**13,673**	6,362		3,582		23,617	**13,673**	9,944
TOTAL	109,384	**109,384**	50,896	**17,184**	28,656	3,582	188,936	**144,004**	58,606

Agenda Item 5: Other matters

5.1 The Meeting had no other matters to discuss.