IA/TF/2

INTERNATIONAL CIVIL AVIATION ORGANIZATION

TASK FORCE ON INSTITUTIONAL ASPECTS

SECOND MEETING
IA/TF/2

REPORT

(Caracas, 20-21 September 2005)

INTERNATIONAL CIVIL AVIATION ORGANIZATION

REPORT OF THE SECOND MEETING OF THE GREPECAS TASK FORCE ON INSTITUTIONAL ASPECTS

IA/TF/2

(Caracas, Venezuela, 20-21 September 2005)

Prepared by the Secretariat September 2005

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History of the Meeting

ii.1 Place and Duration

The Second Meeting of the GREPECAS Task Force on Institutional Aspects was held in the Best Western CCCT Hotel at Caracas, Venezuela, from 20 to 21 September 2005.

ii.2 Opening ceremony and other matters

Mr. Eduardo Rodino, Rapporteur of the Task Force on Institutional Aspects, welcomed the participants to this Meeting and emphasized the importance of the work of this Task Force, as well as the scope of its tasks for this Meeting, and the need to consolidate with the results of the Task Force, the results of the Third Seminar on Institutional Aspects, held in this city from on 19 September 2005.

ii.3 Organization, Officer and Secretariat

Mr. Eduardo Rodino from Argentina acted as Rapporteur, assisted by Mr. Carlos Stehli, Deputy Director, a.i., ICAO South American Office, Mr. D. Wibaux, Director Legal Section from ICAO Headquarters in Montreal and Mr. Paulo Imre Hegedus, Institutional Aspects Consultant of RLA/98/003 Project.

ii.4 Working languages

The working language of the Meeting and its documentation were in Spanish. The Meeting Report was edited in Spanish and English.

ii.5 Agenda

The following Agenda was adopted:

Agenda Item 1: Progress achieved and results obtained since the first meeting of the task force

Agenda Item 2: Review of potential operational scenarios in the CAR/SAM Regions for the implementation and administration of multinational facilities

Agenda Item 3: Cost/benefit studies

Agenda Item 4: Future work of the task force

Agenda Item 5: Other matters

ii.6 Schedule and Working Method

The Meeting examined most of its agenda items as a Plenary. To consider legal aspects and the selection of operational scenarios, it established Ad-hoc Groups, composed as follows:

a) **Ad-hoc Group on Legal Aspects**

Nora Adela Bisso, Argentina (Rappporteur)
Jarbas Ferreira da Cunha Filho, Brazil
César Martínez Ruiz, Venezuela
Denys Wibaux, ICAO

b) **Ad-hoc Group on Operacional Scenarios**

Pedro Larrañaga Cailly, Chile (Rapporteur)
Julio Fortún Landívar, Bolivia
Álvaro Moreira Pequeno, Brazil
Roderico Ochaeta Castellanos, Guatemala
Santiago Rojas Carpio, Venezuela
Rodolfo Monge Pacheco, COCESNA
Paulo Imre Hegedus, RLA/98/003 Project Consultant

ii.7 **Attendance**

The Meeting was attended by 21 delegates from six States and one International Organization, COCESNA. The List of participants is included in this part of the report.

ii.8 **Conclusions and Decisions**

The Task Force on Institutional Aspects recorded its activities in the form of Draft Conclusions, Draft Decisions and Draft Decisions, as follows:

***Draft Conclusion**:* *Conclusions that require GREPECAS approval prior to their implementation.*

***Draft Decision**:* *Decisions that require GREPECAS approval prior to their implementation.*

Decisions: *Decisions dealing with matters of interest to the Task Force.*

ii. 9 **List of Draft Conclusions**

ii.10 **List of Draft Decisions**

ii.11 **List of Decisions**

List of Documentation

WORKING PAPERS

N°	Agenda Item	Title	Prepared by
WP/01	-	Tentative Agenda and Explanatory Notes	Secretariat
WP/02	1	Progress achieved and results obtained since the first meeting of the task force. ACTIVITIES DEVELOPED REGARDING INSTITUTIONAL ASPECTS	Secretariat
WP/03	2	Review of potential operational scenarios in the CAR/SAM Regions for the implementation and administration of multinational facilities	Secretariat
WP/04	3	Cost/benefit studies.	Secretariat
WP/05	3	Cost/benefit studies	Secretariat
WP/06	2	Review of potential operational scenarios in the CAR/SAM Regions for the implementation and administration of multinational facilities	Rapporteur
WP/07	2	Review of potential operational scenarios in the CAR/SAM Regions for the implementation and administration of multinational facilities	Chile
WP/08	4	Future work of the task force	Secretariat

INFORMATION PAPERS

IP/01	-	General Information	Secretariat
IP/02	-	List of working and information papers.	Secretariat
IP/03	5	Other matters. AIRPORT AND AIR TRAFFIC CONTROL MODERNIZATION PROJECT	Venezuela

FLIMSIES

FL/01	5	Other matters. LEGAL GUIDANCE MATERIAL FOR THE ELABORATION OF	Ad-hoc Group on Legal Aspects
FL/02	2	Review of potential operational scenarios in the CAR/SAM Regions for the implementation and administration of multinational facilities. OPERATIONAL SCENARIOS FOR THE IMPLEMENTATION OF MULTINATIONAL FACILITIES/SERVICES	Ad-hoc Group on Operational Scenarios

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Agenda Item 1: Progress made since the first meeting of the Task Force, and results obtained

1.1 Under this agenda item, the meeting took note of the main events in the CAR/SAM Regions that contributed to the advancement in the treatment of institutional aspects, with a view to making progress in the fulfilment of the tasks contained in the work programme of the Task Force. In this regard, it took note of the following:

a) The results of the GREPECAS/12 meeting with respect to the material presented to it as a result of the work done by the Task Force at its first meeting.

b) The work done by project RLA/98/003 in support of the work programme of the Task Force, and the sponsorship it gave to the Third Seminar on Institutional Aspects.

c) The future vision of ICAO with respect to the planning/implementation process and the activities being and to be carried out to amend the Global CNS/ATM Implementation Plan.

1.2 The meeting agreed that the role of the Task Force was to provide guidance so as to facilitate the establishment of agreements within operational scenarios for the implementation of the CNS/ATM systems under the multinational systems concept. In this sense, the Task Force also agreed that matters pertaining to the institutional aspects for the implementation of CNS/ATM systems were progressing at the right pace, and expected that the performance of the tasks and the development of economic and legal guidance material would start to be assigned more importance in the future work of the Group.

1.3 As agreed at the first meeting of the Task Force, a summary of the work done during the Third Seminar on Institutional Aspects was prepared, and the Rapporteur was requested to present this information to the GREPECAS/13 meeting. In this respect, the following decision was formulated:

DECISION 2/1- RESULTS OF THE THIRD SEMINAR ON INSTITUTIONAL ASPECTS

That the Rapporteur of the Task Force document and submit to GREPECAS/13 the results of the Third Seminar on Institutional Aspects, which appear as **Appendix A** to this part of the report.

1.4 When discussing the possibility of holding a fourth seminar on institutional aspects, it was agreed that the agenda for the seminar should put emphasis on economic and legal aspects.

APPENDIX A

SUMMARY OF THE RESULTS OF THE THIRD SEMINAR ON INSTITUTIONAL ASPECTS
(Caracas, 19 September 2005)

1. Development of CNS/ATM systems in the CAR/SAM Regions

1.1 The seminar received information about the development of CNS/ATM systems in the CAR/SAM Regions. This information included the results of the fourth meeting of the GREPECAS ATM/CNS Subgroup, such as the future vision of ICAO with respect to the planning/implementation process, and ICAO activities to amend the Global CNS/ATM Air Navigation Plan. In this regard, note was taken of the plans concerning CNS/ATM systems and the tendency to implement ATFM as an important element to begin the implementation of CNS/ATM systems within the framework of the ATM operational concept, and according to the terms established by the 35 session of the ICAO Assembly, with a view to the implementation of the global ATM.

1.2 The information provided included the progress made by GREPECAS in the treatment of institutional aspects. On this matter, COCESNA described the institutional aspects related to the operation of this organisation, as well as the progress made in CNS/ATM implementation.

1.3 Brazil made an extensive presentation on CNS/ATM developments, and explained the operation of the CAR/SAM monitoring agency (CARSAMMA), its tasks and objectives, as well as the regional arrangements established for its operation. It also explained the development of the Air Navigation Management Centre (CGNA) in its different phases. It stated that the CGNA could help with the development of ATFM in the CAR/SAM Regions, based on the Brazilian experience. As to GNSS matters, an explanation was given of the plans for developing the GNSS Performance Monitoring System as a way to advise aviation on the reliability of GPS navigation signals, and make maximum use of its availability under current conditions.

1.4 Venezuela explained the investments it will make, with the support of ICAO Technical Cooperation, in order to improve and modernise its existing aeronautical infrastructure. It also presented its plans for the implementation of a LUT of the COSPAS/SARSAT system, and explained the advantages it would bring to the CAR/SAM Regions.

2. Work of project RLA/98/003 in support of the development of institutional aspects

2.1 The consultant on institutional aspects of project RLA/98/003 explained the tasks and results of the cited project regarding the definition of operational scenarios for the implementation of the multinational facilities/services identified by the Institutional Aspects Task Force and approved by GREPECAS. An explanation was given of the criteria used and the results obtained in this respect. The results of the study revealed two viable options for the implementation of investment projects concerning multinational systems, such as digital networks, ATFM, AIS automation, and GNSS SBAS augmentation. The seminar noted that this was a preview of the material to be discussed at the second meeting of the Institutional Aspects Task Force, where the aforementioned results would be submitted to the consideration of the Group. Likewise, the future outlook of multinational systems development was presented, and it was noted that some multinational systems approved by GREPECAS still needed to make some technical/operational progress.

3. Legal aspects

3.1 Two legal presentations were made, one on global legal matters and the options for the establishment of multinational organisations for managing multinational facilities/services, and the other related to regional matters in this connection. This issue of legal aspects generated an intense and extensive exchange of ideas during the seminar, noting that it would be advisable for the Task Force to analyse the material presented in both cases and, if necessary, to develop some guides concerning the legal component of the establishment of a multinational organisation.

Agenda Item 2: Review of possible operational scenarios in the CAR/SAM Regions for the implementation and management of multinational facilities

2.1 Under this agenda item, the meeting reviewed a working paper describing the work done by regional technical cooperation project RLA/98/003, and which appears as **Appendix A** to this part of the report. In this respect, the meeting took note of the aforementioned work and discussed it on a preliminary basis, reaching the conclusion that it would be advisable to create an *ad-hoc* group made up by Brazil, Bolivia, Chile (rapporteur), Guatemala, Venezuela, COCESNA, and the Consultant on institutional aspects of the cited project, to make a more in-depth analysis of the material prepared by project RLA/98/003 for the implementation of multinational facilities.

2.2 As a result of the work of the *ad-hoc* group, the following matters were considered:

a) Identification and validation of the operational scenarios proposed by project RLA/98/003 and their combination.

b) Identification of possible multinational facilities to be implemented in the scenarios.

c) Formulation of a strategy and a methodology for the implementation of the facilities identified.

Identification and validation of the operational scenarios proposed by project RLA/98/003 and their combination

2.2.1 In this respect, the meeting took note of the viewpoints expressed by COCESNA, recalling that stated by GREPECAS/12, regarding the fact that COCESNA was a valid and operational scenario, and that scenarios of this nature should be used as examples. In this sense, it was agreed that the COCESNA scenario would be called the CAM scenario, and that it would have no technical/operational obstacles for its expansion and interoperability with other neighbouring scenarios. On the other hand, and considering this designation for the COCESNA scenario, it was also agreed that the scenario made up by Mexico, Central and Eastern Caribbean would be called the CAR scenario, leaving the ICAO SAM Region as the SAM scenario.

2.2.2 Based on the above, five scenarios were assessed, namely:

1. **Scenario A** Status Quo, that is, the existing organisation remains unchanged.

2. **Scenario B** brings together scenarios CAM, CAR and SAM into a single scenario.

3. **Scenario C** includes a SAM scenario, and the combination of the CAM and CAR scenarios into a single scenario.

4. **Scenario D** considers separately a SAM scenario, a CAR scenario, and a CAM scenario.

5. **Scenario E** considers the CAR and SAM scenarios as a single scenario, and a separate CAM scenario.

2.2.3 The Status Quo scenario was discarded, given the multinational nature of the facilities to be implemented, leaving scenarios B, C, D, and E as operationally and technically valid. This conclusion was reached on the basis of the methodology and scoring described in Attachment B to Appendix A, a document prepared based on the contributions of project RLA/98/003. From the analysis made, it is inferred that the scenario with the highest score in technical/operational and administrative terms is scenario D.

Identify possible multinational facilities for implementation in the scenarios

2.2.4 Taking into account the aforementioned scores, which favoured scenario D, the meeting agreed that its full validation should be based on the cost-benefit analysis of the multinational facilities that could be implemented in said scenario. It was also noted that cost-benefit analyses might give different scores for the various combinations.

2.2.5 The meeting ratified the multinational facilities mentioned in Decision 12/5 of GREPECAS/12, and, based on the inputs and reasons given by regional project RLA/98/003, selected the multi-service/multi-protocol digital network systems, the air traffic flow management system, AIS automation and GNSS SBAS augmentation, for implementation in the short and medium term.

Establish a strategy and methodology for the implementation of the identified facilities

2.2.6 The meeting reviewed the strategy for the implementation of multinational CNS/ATM facilities and the underlying principles. This appears in Attachment A to Appendix A. In this regard, the meeting recognised the merits of the cited strategy, and agreed that the Task Force should refine it, and future meetings revise it, based on the developments to take place in the short run.

2.3 The meeting went on to study the possibility of establishing inter-scenario multinational facilities on grounds of safety, cost-benefit considerations and State interests. In this regard, it recognised that this matter should not be seen as a problem, since the inter-scenario operability of operational applications could be guaranteed through appropriate and timely technical/operational/administrative interface documents and through the interconnection of digital communication platforms that were representative of the scenarios involved.

2.3.1 Regarding the above, the meeting agreed to formulate the following draft conclusions to be submitted to the consideration of GREPECAS:

DRAFT
CONCLUSION 2/2 - OPERATIONAL SCENARIOS IN ICAO CAR/SAM REGIONS

That:

a) States consider the CAM, CAR, and SAM scenarios, as defined in Appendix A to this part of the report, as potential operational scenarios for the implementation of multinational facilities;

b) CAR and SAM States, in coordination with the respective ICAO Regional Offices, study the most appropriate mechanisms for the implementation of multinational facilities in said scenarios;

c) as part of the studies to be carried out by the mechanisms mentioned in b) above, a study be made of the regional multinational organisations that are best suited to manage the multinational facilities; and

d) Regional Offices report to the GREPECAS mechanism on the progress made in the implementation of this conclusion, so that it can be analysed by the Institutional Aspects Task Force.

DRAFT
CONCLUSION 2/3 – INTER-SCENARIO MULTINATIONAL SYSTEMS

Taking into account that, for the sake of safety, cost-benefit considerations and State interests, the ICAO CAR/SAM Regions might require the implementation of multinational facilities that involve more than one operational scenario, that the Regional Offices coordinate the activities required to reach the appropriate institutional agreements that will permit the efficient operation and management of these possible inter-scenario multinational systems.

2.4 Finally, the meeting was presented with an amendment to the definition adopted by the Task Force and submitted to GREPECAS regarding the meaning of a Regional Multinational Organisation. In this sense, it was noted that the amendment did not involve significant changes in substance and, although it completed some aspects, it was felt that it should be reviewed subsequently, in light of the developments that would take place in the short run. In this regard, the Task Force felt that it was necessary to keep the proposed amendment for its internal work.

APPENDIX A

GUIDANCE MATERIAL

INSTITUTIONAL ASPECTS FOR THE IMPLEMENTATION OF CNS/ATM SYSTEMS IN THE CAR/SAM REGIONS

REGIONAL PROJECT RLA/98/003

I. INTRODUCTION

1.1 This material is intended as a guide so that, within the regional scenarios identified herein, consideration be given to the implementation of the multinational facilities/services identified by the GREPECAS/12 meeting (Decision 12/5).

1.2 The following documents were used as the documentary basis for the work:

CAR/SAM ANP – FASID;
Global CNS/ATM Plan;
CAR/SAM Regional CNS/ATM Plan
Report of GREPECAS/12;
Report of AI/GT/1;
REDDIG and CARSAMMA;
Report of AN-Conf/11 - Global ATM operational concept;
Chapter 16 of the guidance material prepared by Regional Technical Cooperation Project RLA/98/003.

II. Current status and basic proposals

2.1 Background

ICAO CNS/ATM systems were endorsed by the Tenth Air Navigation Conference held in 1991 at ICAO Headquarters in Montreal, Canada. That same year, the Caribbean and South America Regional Planning and Implementation Group (GREPECAS) started working with a view to the regional application of this new concept of air navigation services. Likewise, the postulates of the new ICAO global ATM operational concept, which received the support of the States at the Eleventh Air Navigation Conference (AN-Conf/11, Montreal, September 2003), became relevant tasks of GREPECAS concerning ATM planning, implementation and operation in the CAR/SAM Regions.

2.1.1 According to the guidelines on facilitation of inter-regional harmonisation established by the ICAO Council, the regional CNS/ATM implementation plans in the Regions should be drafted based on the general profiles defined in the Global Air Navigation Plan for CNS/ATM systems. Following a thorough study of the guidelines contained in this Global Plan, GREPECAS adopted them and incorporated characteristics specific to the CAR/SAM Regions, based on the definition of homogeneous areas and main traffic flows.

2.1.2 On the other hand, it should be noted that the implementation of CNS/ATM technologies should be done in keeping with ICAO Assembly Resolution A35-15.

2.2 Regional implementation strategy

2.2.1 The regional implementation strategy defined by GREPECAS is expressed in terms of ATM improvements to be achieved, to the extent necessary, through the application of modern CNS/ATM technologies in the main traffic flows identified in the homogeneous areas. Nine homogeneous areas and 18 main flows have been considered as the basis for planning in the CAR/SAM Regions. The most significant air traffic flows in the CAR/SAM Regions encompass both regions, and many extend to adjacent regions, such as the AFI, EUR, NAM, NAT and PAC Regions.

III. CAR/SAM regional strategy for the implementation of regional and/or sub-regional CNS/ATM facilities and services

3.1 General considerations

3.1.1 Organisational aspects related to CNS/ATM implementation are of special significance. Advanced technology in the areas of communications, navigation, and surveillance offers the possibility of improving the performance capabilities of air traffic facilities. Therefore, it will be possible, and technically and economically viable, to provide services in vast geographical areas, thus reducing the number of ATM facilities and services.

3.1.2 In view of the above, future ATM scenarios contemplate much larger service areas and will thus require institutional arrangements that are different from those developed through the years for the existing decentralised air navigation systems, which were generally provided, operated, and owned by each State. It is therefore considered that, within the regional planning processes, a centralised control of some facilities and services would be beneficial in technical, operational, and financial terms.

3.1.3 The new ICAO global ATM operational concept, which was endorsed by the States at the AN-Conf/11, requires a service management system in order to achieve an operationally seamless regional airspace. Therefore, strategically speaking, a series of ATM functions will need to be carried out in the CAR/SAM Regions by regional or, at least, sub-regional facilities and/or services.

3.1.4 In order to fulfil the task of managing regional/sub-regional ATM systems, there needs to be a recognition of its complexity and of the fact that the end goal should be the implementation of the elements contemplated in the ATM operational concept, according to Rec. 1/1 of AN-Conf/11, with all the aspects related to the required quality of the system. However, it is also necessary to recognise that there needs to be a gradual evolution on this issue.

3.1.5 It is also necessary to visualise the above in light of the studies of CAR/SAM traffic forecasts, which show that air traffic in these regions will increase significantly in the coming years. This will pose the operational need to increase the ATFM strategic measures to be applied, based on the implementation of modern CNS/ATM technologies in the main air traffic flows, many of which extend beyond CAR/SAM Regions. In this sense, it might be said that the gradual implementation of the ATFM function would represent an appropriate first step towards the implementation of the ATM operational concept, which might require a centralised ATFM unit in order to introduce strategic planning processes for an optimum configuration of future operations in the airspace where this ATFM unit will operate.

3.1.6 It should be noted that the establishment of a Regional ATFM Centre does not exclude the need to have national ATFM units to carry out tactical and local flow control activities that are part of the Regional ATFM System.

3.2 **Planning principles**

3.2.1 The strategy for the implementation of multinational facilities in the CAR/SAM Regions and their subsequent management by the organisations considered to be the most appropriate for that purpose, is shown in **Attachment A**, together with the principles based on which it was developed.

IV. CAR/SAM scenarios for the implementation of regional multinational organizations (RMOs)

4.1 For the purposes of this document, ICAO scenarios for the operation and management of multinational navigation facility(ies) are defined as operationally seamless airspaces that permit an optimum configuration of air traffic operations in the main CAR/SAM flows, where ATM systems and their CNS facilities must be managed and operated in a centralised manner through a Regional Multinational Organisation (RMO).

4.2 It should be noted that, in principle, the vertical limits of the cited airspace are the same as those of the current UIRs, that is, above FL 245, and its horizontal limits are the same as those of the UIRs that make up the CAR/CAM and SAM Regions. In the case of the CAM scenario, vertical limits start at FL200 (inclusive).

4.3 Likewise, the COCESNA scenario shall be called the CAM scenario. On the other hand, and taking into account this designation chosen for the COCESNA scenario, the CAR scenario will be that made up by Mexico, the Central Caribbean and the Eastern Caribbean, leaving the ICAO SAM Region as the SAM scenario.

4.4 **CAR/SAM scenarios**

4.4.1 Scenario A:
STATUS QUO (the current organisation remains unchanged)

4.4.2 Scenario B: CAR/CAM/SAM scenario
It groups the airspaces of the CAM (COCESNA) + CAR + SAM Regions in a single airspace.

4.4.3 Scenario C: SAM airspace + CAM/CAR airspace
1 SAM airspace
1 CARIBBEAN/CENTRAL AMERICAN (COCESNA) airspace

4.4.4 Scenario D: SAM AIRSPACE + CAM AIRSPACE + CAR AIRSPACE
1 SAM airspace
1 CENTRAL AMERICAN (COCESNA) airspace
1 CARIBBEAN airspace

4.4.5 Scenario E: CAR/SAM AIRSPACE
It groups the airspaces of the CAR + SAM Regions in a single airspace
Remarks: We consider that the aforementioned basic scenarios may generate operational and technical sub-scenarios that will be analysed subsequently.

4.5 **Analysis of regional/sub-regional scenarios**

4.5.1 In order to study the institutional aspects of the scenarios shown in paragraph 4.3, we will use the methodology proposed in Chapter 16 of the Guidance Material for the Evolution towards the Global ATM in the CAR/SAM Regions, trying even to make use of some of the analytical criteria used in this chapter. Therefore, in order to analyse the multinational navigation facilities that will be part of the political/administrative/operational and technical structures of the RMOs responsible for managing the airspace of each scenario, we will analyse how and how intensely does each scenario meet or react to the cited analytical criteria.

4.5.2 The critical criteria--national sovereignty, national security, ease of access to the system, and safety--were thoroughly analysed in the aforementioned comparative study, which established that the Regional Multinational Organisation (RMO) best served the needs of the two Regions. The scenarios that we analyse in this paper only consider the RMO option, so a new analysis of these criteria would be redundant and repetitive.

4.5.3 Taking into account that the CAR/SAM Regions, through GREPECAS, have already endorsed the option of a Regional Multinational Organisation to manage CNS/ATM facilities in their Regions on a supra-national basis, we may assume that the criteria to be used in the comparative study cited in paragraph 4.5.1 will not propose an absolutely obstructive argument, but may identify the best criterion for a given scenario as compared to another scenario.

4.5.4 According to the report of the GREPECAS/12 meeting, which is reflected in in Attachment A, we are adding the following criterion to our comparative study: “THE ORGANISATION MUST CONSIDER THE MULTINATIONAL SYSTEMS CURRENTLY IN EXISTENCE OR IN OPERATION”.

4.5.5 Scenario A, Status Quo, does not consider the implementation of an OMR; therefore, in our opinion, it does not qualify.

4.5.6 Also, according to the report of the GREPECAS/12 meeting, paragraph 3.1.3, we should consider that **Scenarios B and C,** although they exist, in realistic terms and according to **Principle j) of Attachment A** to this paper, they may be considered as viable scenarios, provided COCESNA is seen as the multinational system for these two scenarios.

Remarks: The detailed analysis can be seen in **Attachment B** to this study.

4.6 **Conclusions of the analysis**

4.6.1 From table 2 of Attachment C, we may conclude that scenarios **B, C, D** and **E** have a very similar score, and, in operational and technical terms, they are all fully viable. **In summary:**

1- **Scenario C:**
1 SAM AIRSPACE + 1 CAM/CAR AIRSPACE;
VIABLE

2- **Scenario B:**
1 CAR/CAM/SAM AIRSPACE;
VIABLE.

3- **Scenario E:**
1 CAR/SAM AIRSPACE;
VIABLE

4- **Scenario D:**
1 CAR AIRSPACE + CAM AIRSPACE + SAM AIRSPACE;
VIABLE

4.7 **Viable scenarios**

4.7.1 Therefore, we may consider the aforementioned scenarios as fully viable in technical/operational/administrative terms.

4.7.2 Finally, we feel that these four scenarios should be the basis for the economic-financial study, using CBA models that will provide important elements for the range of proposals to be submitted to the GREPECAS Institutional Aspects Task Force (GT/AI/1).

V. General guidelines on institutional arrangements for the regional management of ATM systems in the CAR/SAM Regions

5.1 To address this issue, consideration is given to the guidelines and conclusions from the various worldwide meetings (AN-Conf/10, An-Conf/11), to the guidance material contained in the CAR/SAM FASID on the establishment of multinational facilities developed by the CAR/SAM/3 RAN meeting, and to GREPECAS conclusions, particularly Conclusion 12/4 of the GREPECAS/12 meeting. On the other hand, consideration is also given to Chapter 16 of the Guidance Material for the Transition to CNS/ATM Systems, developed by Project RLA/98/003, in the part concerning the comparative study of options for a regional multinational mechanism for the CAR/SAM Regions. In this sense, this study considers that, for the management and operation of ATM systems or their elements, it would be best to establish **Regional/Sub-regional Multinational Organisations in the CAR/SAM Regions**, based on the studies being carried out within the context of GREPECAS.

5.2 Once the scenario, together with its facilities to be managed by a given RMO, have been agreed upon, the definitive institutional, financial, economic, and legal arrangements for the operation of said RMO will be developed in the form of an administrative agreement or treaty among the States/Organisations, as applicable, based on the guidance provided in the CAR/SAM FASID in this respect.

VI. CAR/SAM regional/sub-regional organisations and their structure

6.1 For many years, and with the purpose of implementing the facilities recommended in the ICAO Air Navigation Plan, many States have been providing various bilateral services to each other, where both parties have benefited. Although bilateral agreements continue to be common practice for the implementation of the Air Navigation Plan, technological developments, high costs and the multinational nature of ICAO CNS/ATM systems require that attention be paid to other organisational arrangements for the funding, implementation, and future administration of airport and air navigation systems.

6.2 Based on the above, a feasible option for the implementation of CNS/ATM systems would be to have a Regional Multinational Organisation to manage a series of multinational facilities. A Regional Multinational Organisation could be defined as (definition approved by GREPECAS):

A regional/sub-regional international organisation created on the basis of an agreement among those States interested in operating a multinational facility, with legal capacity, managerial and financial autonomy, capable of contracting, acquiring, litigating and disposing of the goods and services of the Organisation.

6.3 On the other hand, an **ICAO multinational air navigation facility** could be defined as *"any facility included in an ICAO ANP that is intended to serve international air navigation in an airspace that extends beyond the airspace handled by a single State, according to the aforementioned plan."*

6.4 **Guidelines on the possible basic structure of a Regional Multinational Organisation (RMO)**

6.4.1 CAR/SAM RMOs could be structured in **3 levels**:

6.4.2 In the upper level, which we might call the **political/administrative level**, there must be an equitable and balanced participation by authorities from all the States in which the RMO performs administrative, operational and technical functions with respect to air navigation facilities. The upper administrative structure of the RMO will be located at this level. It may also include specific agencies, such as the regional collecting agency, ATM/CNS regional planning sectors, as well as activities such as regional flight calibration planning; training and human resources; regional air navigation service data banks; AIS data banks; etc.

6.4.3 The intermediate level, which we might call the **operational level,** will host the regional operational bodies (ROBs), whose focal point will be the Regional ATM Centre. We confirm our perception that the first ATM body to become regionally operational will be the Regional ATFM Centre.

6.4.4 The third level, which we would call the **technical level,** would include ATM support facilities in the C, N, S, AIS, MET, and other areas.

ATTACHMENT A TO APPENDIX A

PRINCIPLES FOR THE ESTABLISHMENT OF A STRATEGY FOR THE IMPLEMENTATION AND SUBSEQUENT ADMINISTRATION OF MULTINATIONAL FACILITIES IN THE CAR/SAM REGIONS

a) CNS/ATM technology, because of its nature, is technically and economically viable, and can provide services in large geographical areas, thus reducing the number of facilities required for the provision of ATM services;

b) Future ATM scenarios envisage much broader service areas and, as such, will require institutional arrangements that are different from those that have been developed throughout the years for the existing decentralised air navigation systems;

c) Within the regional planning process, a centralised control of some facilities would be beneficial in technical, operational and financial terms;

d) The new GLOBAL ATM OPERATIONAL CONCEPT requires a service management system in order to achieve a seamless regional airspace. Therefore, at the strategic level, a series of ATM functions will need to be carried out in the CAR/SAM Regions by regional or, at least, sub-regional facilities and/or services;

e) The results of air traffic forecast studies foresee a sustained traffic growth in the main CAR/SAM flows. This item will require a strategic planning in order to obtain an optimum configuration of air operations. Thus, we may infer that regional/sub-regional ATFM implementation could be an appropriate first step towards the evolutionary implementation of the ATM operational concept;

f) For purposes of managing and operating ATM systems or their elements, it is felt that it would be best to establish Regional/Sub-regional Multinational Organisations in the CAR/SAM Regions, based on the studies being carried out by GREPECAS;

g) The List of Possible Multinational Systems, approved by GREPECAS/12 through Decision 12/5, contains the systems that can be implemented as multinational facilities in the CAR/SAM Regions in a gradual and evolutionary manner.

h) A *sine-qua non* condition is that the structure to be chosen for the CAR/SAM Regional Multinational Organisation (RMO) **must meet the criteria** of operational, technical and economic viability;

i) The final decision regarding the structure to be chosen for the CAR/SAM RMO(s) will have a strong regional political component;

j) The institutionalisation of the regional ATM must take into account multinational cooperation and integration, without excluding those systems already in operation;

k) The Regional Multinational Organisation must have legal capacity, with financial/economic management and autonomy, to which end it should include, *inter alia*, a Joint Central Collecting Agency in its organisational structure.

REGIONAL STRATEGY FOR THE IMPLEMENTATION OF REGIONAL AND/OR SUBREGIONAL FACILITIES

a) Initially, the CAR/SAM Regional Strategy for the implementation of CNS/ATM Systems should be used as a basis to promote ATM improvements through the use of modern CNS/ATM technologies in the main traffic flows identified in the homogeneous areas. These technologies must be implemented gradually and with a view to supporting and expanding the performance capabilities of air traffic facilities. The nature of the new CNS/ATM technologies will permit the provision of services in large geographical areas, thus reducing the number of facilities required to provide ATM services in CAR/SAM airspaces. It is important to note that these implementations must always be supported and justified by cost-benefit analyses (CBAs).

b) The **List of Possible Multinational Systems**, approved by GREPECAS/12 through Decision 12/5, lists the systems that can be implemented as multinational facilities in the CAR/SAM Regions.

c) The GLOBAL ATM OPERATIONAL CONCEPT requires a service management system in order to achieve an operationally seamless regional airspace. Therefore, **a series of ATM functions in the CAR/SAM Regions will need to be centralised and carried out by regional or, at least, subregional facilities and/or services;**

d) Strategic planning for an optimum configuration of air traffic operations in the main CAR/SAM flows will require **the implementation of regional/sub-regional ATFM bodies**, as an appropriate **first step** towards the evolutionary implementation of the ATM operational concept**;**

e) In the CAR/SAM airspace scenario, the best would be to establish **Regional/Sub-regional Multinational Organisations (RMOs) to manage and operate ATM systems or their elements**.

f) In establishing these RMOs, consideration should be given to the List of Possible Multinational Systems and to the fact that the first ATM function that will require a supra-national institutional arrangement for its management will be ATFM.

g) In a first phase, consideration would be given to the inclusion in this RMO structure of a Regional ATFM Centre and its supporting facilities (REDDIG, regional AIS data bank, regional SBAS system management).

h) The next step would be the establishment of the CAR/SAM airspace scenarios that will be managed by a given RMO, and the selection of the most viable scenarios in technical and economic terms. The economic-financial analysis of these scenarios is of special importance so that the process may be subsequently taken to the decision-making levels of the States through the GREPECAS mechanism.

i) Concurrently with the economic and financial analysis of the scenarios, studies should be made to define the principles leading to the establishment of an institutional framework, based on which the multinational facilities may be managed as part of a regional/sub-regional system for the provision of air navigation services.

ATTACHMENT B TO APPENDIX A

ANALYSIS OF SCENARIOS

1. In order to study the institutional aspects of the scenarios listed in paragraph 4.4 of Appendix A, we will apply the methodology proposed in Chapter 16 of the Guidance Material for the Evolution towards the global ATM in the CAR/SAM Regions, trying even to apply the analytical criteria used in that chapter. Therefore, in order to analyse the multinational navigation facilities and/or services that will be part of the political/administrative/operational and technical structure of the RMO(s) responsible for managing the airspace of each scenario, we will analyse how and how intensely does each scenario meet or react to the cited analytical criteria.

Chart No. 1

Safety	Maintenance management	Profitability	Overhead expenses
Operational efficiency	System sharing	Cost recovery	Training-labour costs
Gradual implementation		Resource sharing	Staffing
Coordination			Consider existing systems/RMOs

2. The critical criteria--national sovereignty, national security, ease of access to the system, and safety--were thoroughly analysed in the aforementioned comparative study, which revealed that the Regional Multinational Organisation (RMO) was the one that best met the needs of the two Regions. Now, the scenarios being analysed in this paper only take into account the RMO option, so a new analysis of these criteria would be redundant and repetitive.

3. For purposes of this document, scenarios for the operation and management of ICAO multinational navigation facilities or services are defined as operationally seamless airspaces that permit an optimum configuration of air traffic operations in the main CAR/SAM flows, where ATM systems and their CNS elements must be managed and operated in a centralised manner through a Regional Multinational Organisation.

4. It should be noted that, in principle, the cited airspace has the same vertical limits as the current UIRs, that is, above FL 245, and the same horizontal limits as the existing UIRs in the CAR/CAM and SAM Regions. In the case of the CAM scenario, the vertical limits start at FL200 (inclusive).

5. Likewise, it is agreed that the COCESNA scenario will be called the CAM scenario. On the other hand, and taking into account this designation of the COCESNA scenario, the CAR scenario will be made up by Mexico, the Central Caribbean and the Eastern Caribbean, leaving the ICAO SAM Region as the SAM scenario.

6. Upon comparing the list of CAR/SAM scenarios for the implementation of Regional Multinational Organisations (OMR), whose functions and/or capacities could be more cost-efficient if they were operated through a regional or sub-regional mechanism, the following values were assigned to the options:

NA -	not applicable	0 pts.
AWR -	applicable with reservations	1 pt.
A -	applicable	2 pts.
HA -	highly applicable	3 pts.

7. According to the report of the GREPECAS/12 meeting, which is reflected in Appendix A, for purposes of our comparative study we are adding the following criterion: "THE ORGANISATION MUST CONSIDER THE MULTINATIONAL SYSTEMS ALREADY IN EXISTENCE OR IN OPERATION". Failure to meet this criterion will turn the scenario administratively non viable.

I – Scenario B

1. **CAR/CAM/SAM airspace**

1.1 **Operational efficiency:** The condition of a CAR/CAM/SAM airspace where ATM systems and their CNS elements must be managed and operated in a centralised manner through a single Regional Multinational Organisation. In terms of operational efficiency, it has the following positive characteristics:

a) Uniform management;

b) Minimum coordination;

c) Uniform procedures;

d) Prompt reaction to contingencies;

e) Real-time awareness of the aeronautical situation in a broad CAR/SAM scenario, allowing for a realistic decision-making at a strategic level;

f) Allows for a uniform strategic operational planning

1.1.1 Characteristics that deserve special attention:

a) Need for specific and reliable procedures to address abnormal and contingency situations;

b) The facilities, services and back-up procedures that guarantee a seamless service operation must be clearly defined.

Summary: Criterion applicable - grade A = 2 PTS.

1.2 **Gradual implementation:** The implementation of a single Regional Multinational Organisation for the CAR/CAM/SAM Regions must take into account Principle J: ”The institutionalisation of the regional ATM must take into account the multinational cooperation and integration concept, without excluding systems that are already in operation”. Therefore, it only permits its implementation if COCESNA is considered to be the RMO for the scenario.

Grade: Criterion applicable with restrictions AWR = 1 PT.

1.3 **Operational coordination:** In this scenario, operational coordination is greatly facilitated and, undoubtedly, this is one of the most positive aspects of this option.

Grade: Criterion highly applicable - HA = 3 PTS.

1.4 **Maintenance management**: Maintenance management in a single scenario for the CAR/SAM Regions is feasible and offers positive aspects, such as:

a) Uniform management philosophy;

b) Uniform management;

c) Uniform maintenance procedures and norms;

d) Centralised monitoring, offering an overall awareness of the technical/operational status of the facilities and equipment under its responsibility

1.4.1 There are still some aspects that will require special attention, such as:

a) Due to the geographical extension of the area of responsibility of the CAR/CAM/SAM RMO, the Scope of Control Principle will always be at stake.

b) The uniformity in the management philosophy, procedures and norms will have to be the most appropriate for the tasks; otherwise, the consequences could be quite negative.

Summary: Centralised maintenance management of the facilities and equipment dispersed in such a vast geographical area has very positive aspects, but also inspires caution.

Grade: Criterion applicable - A = 2 PTS.

1.5 **Sharing**: Since there is a single scenario for the CAR/CAM/SAM Regions, the need for sharing facilities is restricted to negotiations between the States, and no difficulties are being anticipated, or, at least, they would be the same as those foreseen for the other scenarios in the study.

Grade: Criterion highly applicable HA = 3 PTS.

1.6 **Profitability**: At first sight, the single CAR/CAM/SAM scenario offers the very favourable possibility of being profitable, and its implementation and operation will be the least expensive. The Scope of Control principle can be a factor that deserves special attention. However, this will have to be confirmed through a CBA.

Grade: To be defined once the CBA has been completed.

1.7 **Cost recovery**: The recovery of the costs involved in operating and managing facilities in a single CAR/CAM/SAM scenario will require an effort and an organisation and monitoring that may be penalised by the Scope of Control Principle. We might say that the advantages and disadvantages are very similar to those mentioned for criterion 1.4 – Maintenance management.

Grade: To be defined once the CBA has been completed.

1.8 **Overhead expenses**: Overhead expenses for this configuration tend to be lower and can be monitored more efficiently. This perception needs to be confirmed in the CBA.

Grade: To be defined once the CBA has been completed.

1.9 **Training:** The training of technical/operational personnel has similar advantages and points of caution as the maintenance management criterion. Economics should also be highlighted, since the duplication of courses will be avoided and training centres can rationalise the use of material and human resources when providing training courses. However, some duplication of efforts will remain due to English (CAR and SAM Regions) and Spanish (CAR/Central America/SAM Regions) language requirements.

Grade: Criterion applicable A = 2 PTS.

1.10 **Human resources**: No difficulties are envisaged for the application of this criterion. Quite the contrary, a scenario that contemplates a single management for the two regions opens up a new outlook in terms of quality and quantity of human resources that will fully meet the needs of the CAR/CAM/SAM RMO.

Grade: Criterion applicable A = 2 PTS.

1.11 **Consideration of existing systems** : The scenario with a single RMO for the CAR/SAM Regions does not consider the existence of other RMOs with the same responsibilities in the two Regions. That could give rise to great difficulties in negotiating the roles and responsibilities of the RMOs that already exist in the CAR/SAM Regions.

Grade: Criterion applicable with restrictions: AWR = 1 PT.

II - Scenario C

2. **SAM AIRSPACE + CAM/CAR AIRSPACE**

2.1 **Operational efficiency**: In Scenario C, the operational efficiency criterion is fully met. Coordination will be much less intense than at present, and procedures will be standard throughout the continent. Likewise, awareness of the aeronautical situation will be in real time in this vast region, thus permitting a prompt reaction to contingencies and a realistic decision-making process at the continental strategic level. Also, considering the existence of two RMOs for the CAR/SAM Regions, it will be possible to establish a mutual back-up structure in the event of failure or abnormal catastrophic condition in one of the RMOs.

Grade: Criterion highly applicable HA = 3 PTS.

2.2 **Gradual implementation**: The implementation of this scenario, which is highly viable in technical and operational terms, presents a significant administrative and political difficulty, since it envisages the absorption of the Caribbean by COCESNA, which would manage the Caribbean and Central America area.

Grade: Criterion applicable with restrictions AWR = 1 PT.

2.3 **Coordination:** The level of operational/technical and administrative coordination required between the SAM and CAR RMOs is perfectly tolerable and should not affect safety and operational efficiency levels.

Grade: Criterion highly applicable HA = 3 PTS.

2.4 **Maintenance management**: Maintenance management in the scenario with two airspaces and, therefore, with two RMOs—one CAR and one SAM—is feasible and has some positive aspects, such as:

a) Uniform management philosophy for a vast geographical area;
b) Uniform management in the continental geographical area;
c) Uniform maintenance procedures and norms for each region;
d) Centralised regional monitoring, permitting a overall awareness of the technical/operational status of the facilities and equipment under its responsibility;

2.4.1 Compared to scenario B (1 CAR/CAM/SAM scenario), there is better compliance with the Scope of Control Principle.

Grade: Criterion applicable A = 2 PTS.

2.5 **Sharing**: Consideration should be given to the sharing of facilities between the two airspaces (CAR and SAM). This will require operational, technical and administrative agreements between the two organisations, which, if well executed, will not affect the critical criteria and the operational efficiency.

Grade: Criterion highly applicable HA = 3 PTS.

2.6 **Profitability**: In Scenario C, considering that we will have two airspaces of continental dimensions, a high profitability can be expected. The Scope of Control Principle will be better met than in Scenario B (one single RMO for the CAR/SAM Regions). However, this needs to be confirmed by a CBA.

Grade: To be defined once the CBA has been completed.

2.7 **Cost recovery**: This criterion is fully applicable. It will also have to be confirmed through a CBA.

Grade: To be defined once the CBA has been completed.

2.8 **Overhead expenses** : More overhead expenses can be expected in this scenario as compared to Scenario B (two RMOs X one RMO). On the other hand, it should be noted that the Scope of Control Principle is better met in Scenario C, and thus the monitoring and supervision of expenditures may be more efficient and effective. A CBA will be necessary to confirm (or discard) these perceptions.

Grade: To be defined once the CBA has been completed.

2.9 **Training**: In Scenario C, training can be rationalised, assigning the responsibility for training in Spanish to the SAM RMO, and that of training in English to the CAR RMO. Coordination will be important to maintain a standard and uniform quality in the training provided by the two RMOs.

Grade: Criterion applicable A = 2 PTS.

2.10 **Human resources**: The criterion is applicable in the SAM Region without major difficulties. It will require special attention in the CAR Region, since it will have to consider both English- and Spanish-speaking personnel.

Grade: Criterion applicable A = 2 PTS.

2.11 **Consideration of existing systems** : Scenario C would have to consider the existing system as the RMO for the CAR/SAM Regions.

Grade: Criterion applicable AWR = 2 PTS.

III - Scenario D

3. **1 SAM AIRSPACE; 1 CAM AIRSPACE (COCESNA); 1 CAR AIRSPACE**

3.1 **Operational efficiency**: In Scenario D, the operational efficiency criterion is fully met. Coordination, although more intense than in Scenario C, will still be less than at present, and procedures will be standard at continental level. Likewise, awareness of the aeronautical situation will be in real time, permitting a prompt reaction to contingencies and a realistic decision-making process at the continental strategic level. Also, considering the existence of two RMOs for the CAR/SAM Regions, it will be possible to establish a mutual back-up structure in the event of failure or abnormal catastrophic situation in one of the RMOs.

Grade: Criterion applicable A = 2 PTS.

3.2 **Gradual implementation**: In Scenario D, not many difficulties are foreseen for a gradual implementation. In fact, it is the option that can be implemented in the shortest term, since it already has an RMO in operation: CAM (COCESNA).

Grade: Criterion highly applicable HA = 3 PTS.

3.3 **Coordination**. The level of operational/technical and administrative coordination required among the SAM, CAM (COCESNA) and CAR RMOs, although more intense than in Scenarios B and C, is perfectly tolerable and should not affect safety and operational efficiency levels.

Grade: Criterion applicable A = 2 PTS.

3.4 **Maintenance management**: Maintenance management in the scenario with three airspaces—CAR, Central America (CAM) and SAM—is feasible and offers positive aspects, such as:

a) Uniform management philosophy for a vast geographical area;
b) Uniform management in a continental or sub-continental geographical area;
c) Uniform maintenance procedures and norms for each region;

d) Centralised regional monitoring, which permits an overall vision of the technical/operational status of facilities and equipment under its responsibility.

3.4.1 Compared to Scenario B (1 CAR/SAM AIRSPACE) and RMO C (2 airspaces), there is a better compliance with the Scope of Control Principle. On the other hand, special care should be taken when standardising maintenance and quality control procedures for the facilities and equipment of the three airspaces.

Grade: Criterion applicable A = 2 PTS.

3.5 **Sharing**: Consideration should be given to the sharing of facilities among the three RMOs (CAR, CAM and SAM). This will require operational, technical and administrative agreements among the three organisations. If well executed, it will not affect the critical criteria or the operational efficiency.

Grade: Criterion applicable A = 2 PTS.

3.6 **Profitability**: The profitability of the three airspaces is considered feasible, but will need to be confirmed through a CBA.

Grade: To be defined once the CBA has been completed.

3.7 **Cost recovery**: This criterion is applicable. It will also need to be confirmed through a CBA.

Grade: To be defined once the CBA has been completed.

3.8 **Overhead expenses**: More overhead expenses can be expected in this scenario as compared to Scenarios B and C (three RMOs X one RMO; three RMOs X 2 RMOs). On the other hand, it should be noted that the Scope of Control Principle is better met in Scenario D, and thus the monitoring and supervision of expenditures can be more efficient and effective. A CBA will be required to confirm (or discard) these perceptions.

Grade: To be defined once the CBA has been completed.

3.9 **Training**: In Scenario D, training may be rationalised, assigning the responsibility for training in Spanish to the SAM and CAM RMOs, and the responsibility for training in English to the CAR RMO. Coordination will be important to maintain a standard and uniform quality in the training provided by the two RMOs.

Grade: Criterion highly applicable HA = 3 PTS.

3.10 **Human resources**: The criterion is fully applicable.

Grade: Criterion highly applicable HA = 3 PTS.

3.11 **Consideration of existing systems** : In Scenario D, this criterion is fully met, since there is already a RMO fully operational in the CAM Region.

Grade: Criterion highly applicable HA = 3 PTS.

IV - Scenario A - STATUS QUO

4.1 **Operational efficiency**: In Scenario A, the operational efficiency criterion is not met. Coordination is much more intense than in Scenarios B, C, and D. Procedures will be consistent with the difficulties that currently exist in the continent. In these regions, it will be practically impossible to have an awareness of the aeronautical situation in real time to permit a prompt reaction to contingencies and a realistic decision-making process at the continental strategic level.

Grade: Criterion applicable AWR = 1 PTS.

4.2 **Gradual implementation**: In Scenario A, gradual implementation is expected to encounter difficulties. In fact, the option can be implemented in a time span that is consistent with the individual possibilities of the States. It already has an RMO in operation: CAM (COCESNA).

Grade: Criterion highly applicable A = 2 PTS.

4.3 **Coordination**. It will require a high level of operational/technical and administrative coordination among States and an intense coordination by ICAO Regional Offices. It is tolerable and should not affect safety and operational efficiency levels.

Grade: Criterion applicable AWR = 1 PTS.

4.4 **Maintenance management**: Maintenance management is feasible.

Grade: Criterion applicable A = 2 PTS.

4.5 **Sharing**: Consideration should be given to facility sharing by the States. This will require operational, technical and administrative agreements among them. If well executed, it will not affect the critical and operational efficiency criteria.

Grade: Criterion applicable A = 2 PTS.

4.6 **Profitability**: Profitability will be very low and needs to be confirmed through a CBA.

Grade: To be defined once the CBA has been completed.

4.7 **Cost recovery**: This criterion is applicable. It will also have to be confirmed through a CBA.

Grade: To be defined once the CBA has been completed.

4.8 **Overhead expenses**: More overhead expenses can be expected in this scenario as compared with Scenarios B, C and D. On the other hand, the Scope of Control Principle is better served in Scenario A, and thus the monitoring and supervision of expenditures can be more efficient and effective. A CBA will be necessary to confirm (or discard) these perceptions.

Grade: To be defined once the CBA has been completed.

4.9 **Training**: In the case of Scenario A, training can be rationalised, but it will be expensive and will require a significant coordination effort.

Grade: Criterion applicable A = 2 PTS.

4.10 **Human resources**: This criterion is perfectly applicable.

Grade: Criterion applicable A = 2 PTS.

4.11 **Consideration of existing systems** : In Scenario A, this criterion is fully met, since there is already an RMO in operation in the CAM Region.

Grade: Criterion highly applicable HA = 3 PT.

V- SCENARIO E - CAR/SAM AIRSPACE

5.1 **Operational efficiency:** The situation of a single CAR/SAM airspace in which ATM systems and their CNS elements must be managed and operated in a centralised manner through a Regional Multinational Organisation. In terms of operational efficiency, it has the following positive characteristics:

a) Uniform management;

b) Minimum coordination;

c) Uniform procedures;

d) Prompt reaction to contingencies;

e) Real-time awareness of the aeronautical situation in a broad CAR/SAM scenario, permitting a realistic decision-making process at the strategic level;

f) It permits a uniform strategic operational planning.

5.1.2 Characteristics that deserve special attention:

a) It needs specific and reliable procedures to address abnormal and contingency conditions;

b) The facilities, services, and back-up procedures that ensure an uninterrupted service operation must be clearly established.

Summary: Criterion applicable in grade A = 2 PTS.

5.2 **Gradual implementation:** The implementation of a single Regional Multinational Organisation for the CAR/SAM Regions will be very difficult and the process will probably be slow and will require total cooperation from the States, and will face all type of obstacles, mainly political and administrative.

Summary: The fulfillment of this criterion is not impossible, but successful fulfillment faces a certain level of difficulty.

Grade: Criterion applicable with reservations AWR = 1 PT.

5.3 **Operational coordination:** In this scenario, operational coordination is greatly facilitated and is, undoubtedly, one of the most positive aspects of this option.

Grade: Criterion highly applicable - HA = 3 PTS.

5.4 **Maintenance management**: Maintenance management in a single scenario for the CAR/SAM Regions is feasible and offers positive aspects, such as:

a) Uniform management philosophy;

b) Uniform management;

c) Uniform maintenance procedures and norms;

d) Centralised monitoring, permitting an overall awareness of the technical/operational condition of the facilities and equipment under its responsibility.

5.4.1 There are still some aspects that will require special attention, such as:

a) Due to the geographical extension of the area of responsibility of the CAR/SAM RMO, the Scope of Control Principle will always be at stake.

b) Uniformity in the management philosophy, procedures, norms and management itself will have to be consistent with the tasks; otherwise, it could have negative consequences.

Summary: Centralised maintenance management of facilities distributed in such a vast geographical area has positive aspects, but also calls for caution.

Grade: Criterion applicable A = 2 PTS.

5.5 **Sharing**: Since it is a single scenario for the CAR/SAM Regions, the need for sharing facilities is restricted to negotiations with the States, and no difficulties are being anticipated, or, at least, they would be the same as those foreseen for the other scenarios in the study.

Grade: Criterion highly applicable HA = 3 PTS.

5.6 **Profitability**: At first sight, the single CAR/SAM scenario offers the very favourable possibility of being profitable, and its implementation and operation will be the least expensive. The Scope of Control principle can be a factor deserving special attention. However, this will have to be confirmed through a CBA.

Grade: To be defined once the CBA has been completed.

5.7 **Cost recovery**: The recovery of the costs involved in operating and managing the facilities in a single CAR/SAM scenario will require an effort and an organisation and monitoring that may be penalised by the Scope of Control Principle. We might say that the advantages and disadvantages are very similar to those mentioned for criterion 1.4 – Maintenance management.

Grade: To be defined once the CBA has been completed.

5.8 **Overhead expenses**: Overhead expenses for this configuration tend to be lower and can be monitored more efficiently. This perception needs to be confirmed through the CBA.

Grade: To be defined once the CBA has been completed.

5.9 **Training:** The training of the technical/operational personnel has similar advantages and points of caution as the maintenance management criterion. Economics should also be highlighted, since the duplication of courses will be avoided and training centres can rationalise the use of material and human resources when providing training courses. However, some duplication of efforts will remain due to English (CAR and SAM Regions) and Spanish (CAR/SAM Regions) language requirements.

Grade: Criterion applicable A = 2 PTS.

5.10 **Human resources**: No difficulties are envisaged for the application of this criterion. Quite the contrary, a scenario that contemplates a single management for the two regions opens up a new outlook in terms of quality and quantity of human resources that will fully meet the needs of the CAR/SAM RMO.

Grade: Criterion highly applicable HA = 3 PTS.

5.11 **Consideration of existing systems**: The scenario of a single RMO for the CAR/SAM Regions does not consider the existence of other RMOs with the same responsibilities in those two Regions.

Grade: Criterion applicable: A = 2 PT.

Table No. 2

CRITERIA	OPERATIONAL EFFICIENCY	GRADUAL IMP.	COORDINATION	MANAGEMENT	SHARING	PROFITABILITY	COST RECOVERY	ORVERHEAD EXPENSES	TRAINING	HUMAN RESOURCES	CONSIDERATION OF EXISTING SYSTEMS	TOTAL
RMO LEVEL												
SC B CAR/CAM/SAM	2	1	3	2	3				2	2	1	16
SC C CAM/ CAR+ SAM	3	1	3	2	3				2	2	2	18
SC D CAM +CAR +SAM	2	3	2	2	2				3	3	3	20
SC E CAR/ SAM	2	1	3	2	3				2	3	2	18
SC STATUS QUO	1	2	1	2	2				2	2	3	15

Agenda Item 3: Cost-benefit analyses

3.1 The meeting noted that project RLA /98/003, based on Decision 12/5 of GREPECAS/12, had developed the guidance material that appears in **Appendix A** to this part of the report. This Appendix documents aspects pertaining to ATFM, AIS automation, and GNSS SBAS augmentation. Aspects concerning regional digital networks were not taken into account, since these projects, currently underway (REDDIG, MEVA, and others), have proven their profitability with a high cost-benefit ratio. It was recognised that the material, although valuable, had to be completed with the required detailed information to carry out a thorough cost-benefit analysis, using the net present value (NPV) approach. In this respect, it was noted that project RLA/98/003 had encountered several difficulties for the conduction of these analyses, at least for the development of a preliminary or pre-feasibility project, such as:

a) The need to define CAR/SAM operational requirements, as well as the plans for ATFM and the services to be implemented through AIS automation.

b) ATFM and AIS automation are new projects in terms of CAR/SAM multinational facilities. Consequently, the absence of a definition of ground capabilities in terms of applications, CNS requirements, and, therefore, an engineering project, prevented the collection of the necessary data for the cost-benefit analysis.

c) Lack of definition of a GNSS augmentation plan for the CAR/SAM Regions, and of the cost of equipment/systems and others.

d) Lack of traffic forecasts by type of aircraft in certain airspaces, and the reduction of flight hours, delays in air operations, capacity/demand aspects, and other factors in which civil aviation would benefit with the implementation of CNS/ATM systems.

3.2 It was recognised that, in order to foster the development of plans for ATFM and automatic AIS information processing systems, GREPECAS should advance on the technical/operational aspects to the extent necessary to permit the development of cost-benefit analyses for the various operational scenarios to be established in the ICAO CAR/SAM Regions.

3.3 The meeting noted that, based on the material contained in Appendix A, an additional analysis had been done for digital networks, ATFM, AIS automation and SBAS, as shown in **Appendix B** to this part of the report. From this additional analysis, it may be concluded that it is highly advisable to implement digital networks as platforms for the implementation of operational applications that will interoperate at regional/sub-regional level. As stated in this document, these digital networks have a high cost-benefit ratio. On the other hand, regarding the possible development of SBAS, and considering the gradual replacement of conventional systems, its prompt implementation and recovery of investment costs also seem advisable.

3.4 The meeting examined some favourable comments made by regional project RLA/98/003 regarding the information on the economic and financial aspects for CNS/ATM implementation presented at the first meeting of the group. The meeting concurred with those comments, and agreed that, as had been foreseen, said material should be used in due time and to the extent necessary.

3.5 Finally, the Task Force agreed to keep the material prepared by project RLA/98/003 as guidance material for the future cost-benefit analyses. This material appears in Appendix A to this part of the report.

APPENDIX A

GUIDANCE MATERIAL ON COST-BENEFIT ANALYSES FOR THE IMPLEMENTATION OF MULTINATIONAL FACILITIES

Project RLA/98/003

1. INTRODUCTION

1.1 The economic feasibility of multinational facilities entails an analysis of costs and benefits for the States as service providers, for aircraft operators, passengers and, eventually, for investors. The calculation of costs and benefits demands a preliminary assessment of projects to demonstrate their operational, technical, economic, and financial feasibility prior to the implementation, operation and maintenance of multinational systems in the Region. The economic results depend on the regional scenario and on the future behaviour of demand and other variables.

1.2 Through Decision 12/5, GREPECAS/12 approved the list of possible multinational systems capable of being implemented in a gradual and evolutionary manner as multinational facilities in the CAR/SAM Regions, and requested the Institutional Aspects Task Force to develop proposals concerning the most suitable way of organising the cost-benefit analyses for their implementation, operation and management. The analysis should follow the directives of the CAR/SAM FASID for the establishment of multinational facilities.

1.3 The Air Navigation Plan includes the document called FASID, made up of the facilities required for international air navigation within a given area. In this sense, it presents the CNS/ATM systems that have the longest planning horizons leading to an integrated global ATM system. The FASID states that it is necessary to make sure that differences in the development and implementation of infant ATM systems in the CAR/SAM Regions will not result in inconsistencies. Thus, ATM evolution in the CAR/SAM Regions, including the transition from traditional systems, has been planned in such a way as to ensure that current safety levels will not be reduced, and that it will permit a gradual improvement of the air navigation system, with due regard to cost-benefit ratios.

1.4 The FASID contemplates the relevant economic provisions and the criteria that govern ICAO regional planning for the implementation of the facilities required for air navigation in the CAR/SAM Regions. These provisions recognise the principle approved by the ICAO Council on recovery of the cost of facilities contemplated in the CAR/SAM Regional Plan, as well as the principles and criteria established in ICAO policies on charges for airports and air navigation services, Doc. 9082, in more detailed guidance material, such as the manual on air navigation services economics, Doc. 9161, Circular 257-AT/106 on the economics of satellite-based air navigation services, and the report on financial and related organisational and managerial aspects of global navigation satellite system provision and operation, Doc. 9660.

2. ANALYSIS OF POSSIBLE SCENARIOS

2.1 The implementation of multinational projects faces a range of possible scenarios, each with different costs and benefits. These scenarios are the basis for determining the size, location and other features of the projects, and define the technical, operational, investment, and demand aspects associated to each multinational facility, as well as their cost and benefits.

2.2 As an example, and just to name a few, benefits will differ in the following cases:

2.2.1 Implementation of one or more multinational facilities.

2.2.2 Size and location of multinational systems, depending on the airspace involved and centralised or decentralised implementation.

2.2.3 Timing of implementation of each system.

2.2.4 Type of contract between the communication service provider, the States and the airlines. The results for the States may vary if airlines decide to contract certain communication services directly.

2.2.5 The transition to the new system involves the elimination of some air navigation aids, the relocation of equipment to some centralised sites, and a period of time during which there will be duplication of equipment.

2.2.6 Self-funding or use of the financial system.

2.2.7 The proportion of CNS/ATM-equipped aircraft, and of aircraft that will have to continue using conventional air navigation equipment, etc.

2.3 The analysis of scenarios gives an idea of what may happen and helps in the selection of the best alternative. In practice, however, it is advisable to start limiting the number of possible scenarios, because, with too many assessment alternatives, there is a risk of becoming immobilised. In this respect, the work done, *inter alia*, by GREPECAS and project RLA98/003, narrows the number of action possibilities for the implementation of CNS/ATM systems in the Region.

3. IDENTIFICATION OF SCENARIOS

3.1 Multinational facilities are specifically identified as such and included in the ICAO CAR/SAM regional plan for the provision of international air navigation services in the airspace that extends beyond the responsibility of a single State, in keeping with the CAR/SAM regional plan. Regarding the above, GREPECAS/12 identified a list of possible facilities to be implemented at the multinational level in the CAR/SAM Regions (**Attachment A**), with respect to which information started to be collected from the Regional Air Traffic Flow Management (ATFM) unit, SBAS augmentation, and AIS automation system, for their economic assessment.

3.2 On the other hand, the Institutional Aspects Task Force established that the best option for managing and operating the multinational facilities would be an international regional or sub-regional organisation created by agreement among those States interested in operating a multinational facility with legal capacity, and managerial and financial autonomy to contract, litigate and assign the goods and services of the organisation. In this proposal, other possible types of organisation are discarded.

3.3 Another proposal involves the review of CAR/SAM operational scenarios for the implementation and management of multinational facilities. In this sense, project RLA/98/003 has developed scenarios for the operation and management of ICAO multinational navigation facilities, which are defined as operationally seamless airspaces that permit an optimum configuration of air traffic operations in the main CAR/SAM flows, where ATM systems and their CNS elements must be managed and operated in a centralised manner through a Regional Multinational Organisation. Of a total of five possible scenarios in the Region, and after applying analytical criteria to the existing alternatives, one CAR/SAM scenario, and one scenario for the CAR and for the SAM Region, were defined as the most recommendable.

3.4 Into the future, it is possible to narrow down possible scenarios even further, by assessing the multinational projects proposed by GREPECAS. Every multinational system has its own characteristics, and by studying the technical, operational, economic/financial, and organisational aspects, it is possible to determine the most appropriate scenario for implementation.

4. PROJECT ASSESSMENT

4.1 Project assessment is defined as the set of background data that permits the analysis of the economic advantages and disadvantages of assigning resources to obtain certain services. When analysing the results, it is inevitable to assume that there is some risk in the forecasts. However well studied, a project cannot contain the details of all the elements that affect it, or of the research, engineering, organisational, funding, start up, and operational issues to be resolved. Nevertheless, it is possible to reduce the uncertainty and the possibility of error through studies such as those mentioned in **Attachment B**.

4.2 The preliminary project provides the necessary information to make the decision of assigning the resources to implement the projects:

4.2.1 The study starts with the Project Profile, in which a technical, demand, economic, legal, and organisational analysis is made, with estimated and global data, and includes the identification of the project idea, solution options, and the assessment of options.

4.2.2 The next phase is the Preliminary or Pre-Feasibility Project, in which the Project is verified and the options reassessed, based on more detailed information and data which, in turn, is based on experience and consultations with providers, subcontractors, and States or bodies that have already implemented similar projects.

4.2.3 In the Definitive Preliminary Project or Feasibility Project, information is based on basic engineering, quotations, and *pro forma* invoices, as well as on similar projects implemented by other States or bodies. Investment, operation and maintenance costs are broken down with precision and at the time they are incurred, representing the financial flow of the project, which is associated to the programme of activities (PERT or GANTT) for its implementation.

5. COST-BENEFIT

5.1 SERVICE RATES AND COSTS

5.1.1 States provide ATS, COM, MET, AIS and SAR air navigation services to the various categories of civil aviation and State users, in the form of en-route, over flight, approach and aerodrome (TWR) charges. These charges permit the recovery of personnel, facility, equipment, input, and service costs.

5.1.2 The new CNS/ATM systems do not provide services other than those already in existence, but allow certain facilities to be replaced, proving extended range and better use of the airspace. The benefit for the States would be the difference between the cost of the new CNS/ATM system, involving state-of-the-art technology, plus the conversion costs, and the cost of replacing, maintaining, and calibrating the equipment of existing systems.

5.1.3 In the long run, if the new CNS/ATM services permit the replacement of all the existing equipment and systems, the income generated by air navigation charges would fully finance the CNS/ATM systems.

5.1.4 CNS/ATM systems, upon extending airspace coverage, offer economies of scale (lower fixed cost per unit of service requested) and multinational contracts that are more favourable than if entered into separately by each State.

5.1.5 The most outstanding benefit of the new systems is for airspace users, since aircraft operators can include more flights in the saturated schedules that have the greatest demand, and can reduce operating costs through more direct flight routes and an optimum performance. Furthermore, passengers benefit with shorter flight times.

5.1.6 If the incorporation of new multinational systems does not reduce the cost of replacing the equipment that uses current technology, consideration should be given to increasing current charges in order to finance the new systems. This increased cost for the users should not exceed the benefit they would derive from the additional demand in peak traffic hours and the lower costs resulting from reduced flight time and optimum flight levels.

5.2 ANALYSIS OF FUTURE COSTS AND BENEFITS

5.2.1 Cost-benefit analysis is used to estimate the economic viability of investment projects, that is, to what extent total benefits derived from investments in CNS/ATM systems exceed total costs. CNS/ATM systems are more complex than most projects due to the multiple implementation alternatives.

5.2.2 A recommended method for the cost-benefit analysis of CNS/ATM systems is based on the net present value (NPV). This means that the future profile of annual costs and benefits inherent to the implementation of CNS/ATM systems in a given airspace, with specific aircraft traffic flows, should be forecast. After determining all income and expenses year by year, including the original investment, the net benefit (income less expenses) corresponding to each year can be estimated and discounted from the annual interest rate to take them to the baseline year.

5.2.3 In order to determine the income and expenses of the project, the demand forecasts that impact the systems under study must be available. In this sense, the FASID provides part of the baseline information for analysing certain multinational systems, such as:

5.2.3.1 Traffic forecasts for the main groups of routes in the CAR/SAM Regions.

5.2.3.2 Aircraft movement forecasts by city pairs, for each group of routes.

5.2.3.3 Types of aircraft by city pair in the groups of routes.

5.2.3.4 Historical trend of occupancy coefficients, average number of seats by groups of routes, and forecasts.

5.2.3.5 Maximum number of aircraft movements per day and hour, by groups of routes.

5.2.4 IATA, aircraft manufacturers, and airlines have useful information for forecasting traffic and aircraft movements.

5.2.5 Prepare estimates of projected benefits and savings for aircraft operators and other users as a result of increased capacity and airspace management due to the implementation of the new systems. Consequently, it is necessary to:

5.2.5.1 Estimate the reduction in flight time, by type of aircraft, in the most direct air routes and airspaces.

5.2.5.2 Estimate the reduction in fuel consumption due to the increased number of aircraft flying at optimum performance levels.

5.2.5.3 Estimate the reduction in flight time due to reduced delays caused by traffic congestion.

5.2.5.4 In order to estimate savings, it is necessary to obtain information about the type of aircraft operating in the routes under study, and the operating costs per flight hour, by type of aircraft, under similar performance conditions.

5.2.6 Multinational systems are funded with the charges imposed by States to recover the cost of en-route, over flight, approach and aerodrome air navigation services. The rates applied by States are described in ICAO and IATA manuals, which show the values and formulae used for collecting air navigation service charges, based on the number of operations, distance, and weight of aircraft. Once all the statistical information and aircraft operation forecasts regarding flight stages, distances between city pairs, and the weight of the aircraft operating in these routes, are known, it is possible to estimate the income from air navigation in the various flight stages in a given airspace. In this manner, it is possible to determine, based on the existing rate structure, the rate increases that would be required to obtain more income to finance multinational systems.

5.2.7 Cost forecasts for the new multinational systems are related to the costs of research, equipment acquisition and installation, support infrastructure, maintenance, personnel, training, inputs, purchase of services, etc. which are part of the definitive draft project or project feasibility study.

5.2.8 Funding can come from internal sources, that is, from the States themselves, or from external sources, in which case, the additional cost of interests and commissions should be taken into account.

5.2.9 Avionics cost forecasts will depend on the increased number of aircraft with new equipment, the price of the equipage of each aircraft, and other expenses associated to the installation of CNS/ATM avionics.

5.3 SENSITIVITY AND RISK ANALYSES

5.3.1 The NPV evaluates the result of the project in one of the planned scenarios, based on a series of antecedents that are subject to some degree of uncertainty during the life of the project and which are unmanageable. In this sense, it is necessary to determine how sensitive the assessment made is to variations in one or more of the parameters considered. The sensitivity analysis is applicable to any project variable, like demand, interest rate, etc. For example, if the assessment of the project reveals that the most likely forecast of tonne-kilometres flown gives a positive NPV in the planned scenario, it is possible to estimate to what extent can tonne-kilometres decrease, or the interest rate cost increase, so that the NPV will be equal to zero, which is the minimum value to approve the project, and assess the likelihood of occurrence of these variations in the future.

5.3.2 Since projects are assessed simulating what may happen in the future, all of the events that will have an impact on cash flows cannot be known with precision. That is why the risks involved in the project are analysed. The less information there is or if the information used to assess the project is not reliable or is misinterpreted, the greater the uncertainty. There are different methods to analyse risk: subjective, statistical, probabilistic, etc.

6. PROFILE OF THE COST-BENEFIT ANALYSIS OF MULTINATIONAL FACILITIES

6.1 In order to obtain information on multinational systems for the purpose of determining their costs and benefits, data was collected from the ATFM Regional Centre, the Regional AIS Databank (ANS), and the Regional SBAS System in the CAR/SAM Regions. This information is contained in **Attachment D**, based on a survey described in **Attachment C**.

6.2 The following are some of the conclusions of this preliminary study:

6.2.1 The information currently available does not permit preliminary cost-benefit assessments.

6.2.2 Technical, operational, and economic studies are required to assess the systems at the definitive or feasibility preliminary project level.

6.2.3 Define a strategy for conducting these studies. Since there is a need to assess multinational systems involving several States, it is logical that it be done through the regional projects of ICAO.

6.2.4 Continue defining scenarios in order to assess the costs and benefits of the alternatives that are feasible of implementation in the Region.

6.2.5 The analysed systems require a Regional Centre (in one or more States of the Region), but do not exclude the need for national units as part of the regional system, and thus require the individual participation of States.

6.2.6 The systems analysed in the Region are not being implemented uniformly in all States. Some States have made progress in the implementation at the trial level while others have not.

6.2.7 In the SBAS augmentation trial project, part of the software, equipment and funding is provided by a State from outside the CAR/SAM Regions.

6.2.8 In general, there is no traffic congestion in the Region, except in peak hours in certain airspace sectors. For this reason, the timing for the implementation of certain multinational systems will differ from State to State.

6.2.9 Although the systems have multinational coverage, they benefit both international and domestic flights in each State of the Region.

6.2.10 Taking into account that systems should be implemented only after their safety, benefits and operational justification have been demonstrated, IATA should be consulted during the study and planning process, as the representative of the users that will benefit from these services.

6.2.11 The complexity involved in the regional implementation of the systems calls for a prompt approval of a strategy for such implementation, through technical cooperation projects and agreements with the States, or other multinational coordination and participation mechanisms.

ATTACHMENT A

LIST OF POSSIBLE MULTINATIONAL SYSTEMS

1. Multi-service/multi-protocol digital voice and data networks (REDDIG, Colombian VSAT network, etc.) used as communication platforms to support the implementation of current and future communication requirements in a cost-efficient manner.

2. ATM automation for centralised functions, such as the implementation of a regional air traffic flow (ATFM) unit.

3. SBAS augmentation corresponding to the results of regional augmentation planning based on regional requirements.

4. AIS/database automation system to facilitate the implementation of the integrated automated AIS system, as recommended in the CAR/SAM Air Navigation Plan.

5. A regional programme for the implementation of in-flight trials of conventional and satellite-based navaids, to facilitate the cost-efficient implementation of ICAO SARPs on this topic, through agreements for regional cooperation and sharing of in-flight trial unit resources.*

6. Aeronautical Mobile Satellite System (AMSS) and/or High-Frequency Data Link (HFDL) to facilitate the implementation of ADS/CPDLC data links in remote (oceanic and continental) areas.*

* Postponed for a second phase.

ATTACHMENT B

PROJECT ASSESSMENT STUDIES

1. **Commercial and operational feasibility**, that is, if required by users and if it represents a benefit for them. It is one of the critical factors of project assessment, and is defined as the identification of users and the extent of their demands through time. This determines operational income, costs, required investment, as well as the optimum timing for start up.

1.1 It is based on service demand forecasts. Demand projection depends on the validity and availability of historical data, the desired precision of the forecast, the projected period, and demand variability through time.

1.2 Information is obtained from official historical series, expert opinions, and surveys. Projections are based on the determination of trends and r2 values.

2. **Technical feasibility**, if the conditions for providing the service are appropriate. Its purpose is to provide information in order to quantify investments, operating costs, capital requirements, remunerations and material resources, for both project start up and operation. Engineering studies, including an analysis of technological alternatives, an estimate of the economy of scale resulting from the size of the investment and the optimum location of the project. Fixes assets, such as land, construction works, equipment; intangible assets, such as the organisation, licences, training, data bases, start up, software, etc.

3. **Legal feasibility**, legal studies of national legislation and ICAO or other multinational body regulations to execute the project. Repercussions on contracts, taxes, ownership of goods, guarantees, powers, labour liabilities, etc.

4. **Organisational feasibility**, such as the functional structure, together with the objectives, human and financial resources required to assess, implement and operate the project. It takes into account the administrative procedures, legal aspects, personnel, offices, equipment.

5. **Investments**, detail of all assets--including working capital--that will be required to implement the project, indicating time of purchase and installation for each, in order to include the respective alternate cost.

6. **Income and costs**, takes into account all actual and accounting cash income and expenses, such as prior studies, initial investments, working capital, start-up expenses, income derived from rates or contributions, asset sales, non-realised costs, such as investment savings, etc. Depreciation is a non-disbursable, tax deductible, expenditure, but does not constitute a cash disbursement or expenditure; it is only used to deduct this expenditure from profits for tax purposes, but is then added for estimating the flow of funds.

7. **Financial feasibility**, determines the funds required, the timing, and funding capability.

8. **Flow of funds**, is the final result of income less expenses of the project on an annual basis, from year zero, when investments and other disbursements prior to start up are accounted for, until the last year of its useful life. The annual result during the life of the project is the one used to assess the project, deducting expenses from income at a given discount rate, and comparing that with the investment.

9. **Economic feasibility**, analyses the profitability of the project, comparing project flows--updated according to a discount rate--with the required investment.

10. **Political feasibility**, is the willingness of the decision-maker to implement or not to implement a project, regardless of its profitability, for strategic or other reasons.

11. **Risk analysis**. The uncertainty about the flow of funds generates variability in the actual cash flows with respect to the estimates (for example, continued operation and cost of the satellite signal). The uncertainty is associated to a probability distribution of project flows. The uncertainty of a project increases as the term increases. If the estimated NPV value is potentially sensitive to changes in a factor such as expected income, the forecast risk is high, and it would be advisable to conduct a market study.

12. **Sensitivity analysis**, measures the range of variability of project cash flow results due to possible changes in the estimates of a given project variable. Unlike the scenario analysis, where many alternatives are considered prior to project implementation, all factors, with the exception of one (for example, demand), are frozen in the sensitivity analysis, and NPV results with respect to changes in this factor are analysed. Frequently, NPV results are analysed in function of fluctuations in the values of the baseline, most likely, best and worst cases. Simulation analysis is a combination of the scenario and sensitivity analyses. Different scenarios with many values for each one are combined in a computer, and the NPV is determined for each case.

ATTACHMENT C

INFORMATION REQUIRED FOR PROJECT ASSESSMENT

1. **Responsibility for implementation**

1.1 Responsibility of the multinational organisation

1.2 Responsibility of the States of the Region

2. **Situation with and without the project (impact)**

2.1 Current situation

2.2 Current situation if the project were in place

3. **Technical and operational aspects of the project**

3.1 Existing documentation (from the manufacturer, the States, multinational organisations that have implemented it).

3.2 Detailed explanation of project scope:

a) Objective and quantification of project goals through time.
b) Detailed description of the equipment, support infrastructure (local and regional), information required and means for obtaining it.
c) Project input and output.
d) Description of users and how they benefit from the project (ANS, air traffic, others), price to be charged, if applicable/cost savings.
e) Quantification of demand through time (units in which the demand is expressed). Historical data and forecasts.
f) Optimum timing for (operational) start up.
g) Project implementation phases and time required for each phase (study, international coordination, equipment pricing, securing of resources, purchase, personnel hiring arrangements, training, purchase/leasing of office facilities, installation, start up, tests.
h) Time required for system operation.
i) System requirements in the short/medium and long run.
j) Organisational and institutional aspects of the project.

4. **Project investment and phases**

4.1 Equipment purchase value, broken down by system component (at the local and regional level).

4.2 Useful life of each component.

4.3 Value of intangible assets of the project (software, system input data), technical/operational feasibility studies, training, tests.

4.4 Appraised physical infrastructure (if applicable).

4.5 Other investments: computers, printers, copying machines, office furniture, facsimile, etc.

5. **Annual expenses associated to each system and airspace**

5.1 Professional, technical, administrative and security personnel required:

a) Staff required by specialty, based on operating hours of the system (H-24, H-12, on request, or other administrative schedule).
b) Yearly salary of each (professional and technical) specialist, administrative and security personnel.

5.2 Benefits:

a) Taxes, medical insurance, income tax and any other expenditure in addition to annual gross remuneration.
b) Trips, *per diems*, extra hours.

5.3 Operating expenses

a) Purchase of services: communications, security, cleaning, and other services.
b) Leasing of offices and other facilities.
c) Maintenance.
d) General services:
   — water supply
   — lighting
   — cleaning
   — telephone/facsimile
e) Inputs:
   — office supplies
   — stationery, etc.

5.4 Interest rate on debt (if applicable) if funding is through a loan.

6. **Annual income or savings associated to each system and airspace**

6.1 Savings in terms of the investments, maintenance and calibration associated with the equipment no longer required due to the incorporation of the new systems.

6.2 Savings in salaries of personnel working in control positions that would be eliminated.

6.3 Economies of scale resulting from dividing the fixed cost of each service by a greater regional demand. The more States participate in a service, the lower the unit cost per kilometre.

6.4 Savings due to multinational contracts.

6.5 Benefits to the airlines from increased number of flights during peak hours.

6.6 Reduced operating costs for the airlines due to more direct flight routes.

6.7 Reduced operating costs for the airlines due to the use of flight levels that permit an optimum performance.

6.8 Reduced operating costs for the airlines due to reduced delays.

7. **Other assessment aspects**

7.1 Expected project profitability/cut-off rate

7.2 Conditions under which the project would be aborted

7.3 Sensitivity analysis

a) Variation in demand forecasts
b) Price of communication services and other system inputs
c) Price of equipment
d) Leasing *versus* buying
e) Changes in the size of the project
f) Changes in the technology
g) Changes in project location

ATTACHMENT D

PRELIMINARY ASSESSMENT OF MULTINATIONAL PROJECTS

The initial collection of information on the aforementioned projects has started, with a view to their subsequent assessment, according to a scheme described in Appendix C.

The detailed information submitted to date by the experts of the ICAO Regional Office in Lima and by the institutional aspects consultant regarding the investment in the ATFM project under way in Brazil, is shown below for each system.

A. ATM AUTOMATION FOR CENTRALISED FUNCTIONS, SUCH AS THE IMPLEMENTATION OF A REGIONAL AIR TRAFFIC FLOW (ATFM) UNIT

1. Responsibility of the multinational organisation

Provide Air Traffic Flow Management (ATFM) service in the CAR/SAM Regions.

Collect and collate data on the air navigation infrastructure and capacity of air traffic control (ATC) systems in the CAR/SAM Regions; and on aerodromes used by international air transport, including the capacity of runways, taxiways and gateways of both Regions.

Collect and analyse the data concerning air traffic (controlled flights) foreseen in the CAR/SAM Regions;

Develop a consistent picture of foreseen traffic demand, including *ad hoc* traffic, a comparison with available capacity, and the identification of zones and duration of critical traffic flows;

Coordinate with air traffic service (ATS) authorities/providers and national traffic flow management units (FMUs), in order to do everything possible to increase the available ATC capacity when necessary.

When the deficiencies in terms of available ATC capacity cannot be eliminated, identify and take the appropriate timely tactical measures in coordination with air traffic service (ATS) authorities/providers, national traffic flow management units (FMUs), and ATFM units of adjacent Regions, as required, and with aircraft operators and aerodromes involved.

2. Responsibility of the States of the Region

Establish the national FMUs or ATFM positions in each control centre for conducting the respective coordination, and provide all the available and required information so that the multinational ATFM organisation can fulfil its functions.

3. Current situation

In general terms, at present, there is no traffic congestion in the CAR/SAM Regions that require complex flow management. However, some airspace sectors, mainly during special periods and peak hours, have been identified as having some traffic congestion basically due to differing capacity of the various ATC systems or parts of them being affected by traffic congestion, inadequate operation planning in some airports, and airport infrastructure limitations.

5. **Current situation if the project were in place**

ATFM implementation would guarantee an optimum air traffic flow to, or through, certain areas, at times when demand exceeds or is expected to exceed the available capacity of the ATC system, reducing aircraft delays, both in flight as well as on ground, without jeopardising the safety of air operations and preventing system overloading.

6. **Technical-operational aspects of the project**

Existing documentation (from the manufacturer, the States, multinational organisations that have implemented it):

ICAO Annex 11, Air Traffic Services;
PANS/ATM ICAO Doc. 4444, Air Traffic Management;
ICAO Doc. 9426, Air Traffic Services Planning Manual;
CAR/SAM Air Navigation Plan (ANP);
CAR/SAM Regional Plan for the Implementation of CNS/ATM Systems;
Report of the Eleventh Air Navigation Conference;
Air Traffic Flow and Capacity Management Strategy - Eurocontrol;
Air Traffic Flow and Capacity Management – Evolution Plan for the ECAC States - Eurocontrol.
Control Flow Management Unit (CFMU) Basic Handbook - Eurocontrol;
CFMU Handbook Supplements - Eurocontrol.

6.1 **Detailed explanation of the scope of the project**

6.1.1 **Objective and quantification of project goals through time**

The objective of the project is to establish a Centralised Regional Unit for the provision of ATFM services in the CAR/SAM Regions, in coordination with the FMUs or national ATFM positions, to supplement the ATC service provided by the respective ATS authorities/providers of both Regions.

6.1.2 **Reference to the optimum timing for (operational) start up**

According to the CAR/SAM Air Navigation Plan (Basic Document and FASID), in most CAR/SAM traffic flows contained in the ATM Evolution Tables, the implementation target data for national FMUs is 2008, and for the regional ATFM, 2010.

6.1.3. Project implementation phases and time required for each phase (study, international coordination, equipment quotations, securing of resources, purchase, personnel hiring arrangements, training, purchase/leasing of offices, installation, start up, tests.

This matter will be analysed by the ATFM TF of the GREPECAS ATM Committee during the centralised ATFM planning phases.

6.1.4. Time required for system operation is permanent.

7. **Project investment and phases**

ATFM PROJECT
US DOLLARS

CONCEPT	YEAR 0	YEAR 1 TO 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8
SERVICE PROVIDERS						
COSTS						
PLANNING	$ 971.207	$ 73.103	?	?	?	?
MANAGEMENT	$ 331.034	$ 258.621	?	?	?	?
HARDWARE	$ 311.786	$ 2.495.000	?	?	?	?
APPLICATION SOFTWARE	$ 217.800	$ 4.610.000	?	?	?	?
OPERATIONAL SOFTWARE	$ 603.000		?	?	?	?
CONSTRUCTION	$ 1.082.333	$ 1.595.000	?	?	?	?
PERSONNEL	$ 2.689.000	$ 796.687	$ 1.057.993	$ 1.188.647	$ 1.296.993	$ 1.386.000
INPUTS	?	?	?	?	?	?
TRAINING	?	?	?	?	?	?
MAINTENANCE	?	?	?	?	?	?
PURCHASE OF SERVICES	?	?	?	?	?	?
TOTAL COSTS	$ 6.206.160	$ 2.391.687	$ 1.057.993	$ 1.188.647	$ 1.296.993	$ 1.386.000
BENEFITS						
SAVINGS IN EXPENDITURES	?	?	?	?	?	?
EQUIPMENT SUBSTITUTION	?	?	?	?	?	?
PERSONNEL	?	?	?	?	?	?
OTHERS	?	?	?	?	?	?
TOTAL BENEFITS	?	?	?	?	?	?
NET BENEFIT	?	?	?	?	?	?
AIRCRAFT OPERATORS						
COSTS						
AVIONICS	?	?	?	?	?	?
INPUTS	?	?	?	?	?	?
PLANNING	?	?	?	?	?	?
MAINTENANCE	?	?	?	?	?	?
TRAINING	?	?	?	?	?	?
PURCHASE OF SERVICES	?	?	?	?	?	?
TOTAL COSTS	?	?	?	?	?	?
BENEFITS						
SAVINGS IN FLIGHT HOURS	?	?	?	?	?	?
EQUIPMENT SUBSTITUTION	?	?	?	?	?	?
SAVINGS IN EXPENDITURES	?	?	?	?	?	?
OTHERS	?	?	?	?	?	?
TOTAL BENEFITS	?	?	?	?	?	?
NET BENEFIT	?	?	?	?	?	?
PASSENGERS						
BENEFITS	?	?	?	?	?	?
TOTAL NET BENEFITS	?	?	?	?	?	?

7.1 The attached information on costs is derived from the air traffic flow management (ATFM) service of Brazil. In this regard, the following comments and requests for information are presented in order to assess the project:

7.2 Starting with a baseline project, and in order to assess different scenarios and determine the sensitivity to variations in given variables, it is advisable to have details as precise as possible of project engineering. Identification of airspace sectors, the current capacity of air navigation infrastructure and aerodromes, requirements and coverage of ATFMs and FMUs to be implemented in the region, and, associated to this service, the facilities and equipment, specifying human, material, and financial resources required in each location considered as an ideal site for equipment installation. Service coverage by geographical area should permit the identification of additional costs and benefits derived from the provision of the service. In this sense, each area would cover a given traffic flow, where it is possible to establish the demand by type of aircraft during specific time periods.

7.3 In order to assess an ATFM project, it is necessary to know all of the projected benefits and costs for ATM service providers, aircraft operators and passengers.

7.4 Since the study is done at a regional level, it is necessary to define the facilities and services that are not included in the Brazilian project, in order to determine the total cost for the Region.

7.5 The engineering costs of the project need to be projected through its useful life.

7.6 As already stated, it is necessary to establish the benefits that commercial aviation would derive from the ATFM project, in terms of reduced flight hours as a result of this regional project.

7.7 In order to determine the benefits for each State, it is advisable to associate the costs that would correspond to each State (in a trust cost prorating system) to the reduction in the number of flight hours in its airspace. The project should also establish the benefits for each airline in given routes.

7.8 Historical traffic flow data by type of aircraft and city pair, and demand forecasts, in order to quantify delays by type of aircraft in given segments.

7.9 Data on the cost per hour, by type of aircraft.

B. IMPLEMENTATION OF AN AIS DATABASE FOR THE CAR/SAM REGIONS

1. The multinational organisation that will be responsible for this type of project in the region has not been defined yet.

2. Organisational and institutional aspects of the project.

The project can only be implemented through a regional project, where all the States will make trust fund contributions.

A regional database located in one State of the region, with a similar back-up system in another State of the region; a database terminal in each of the participating CAR/SAM States.

All aeronautical information processed by CAR/SAM States.

3. Responsibility of the States of the Region

At present, and despite the action taken by GREPECAS, each State is implementing AIS automated systems independently; therefore, regional coordination is required.

At present, the automated processing of aeronautical information (NOTAMs) is being partially done by only six (6) SAM States (Brazil, Chile, Colombia, Ecuador, Peru and Uruguay), and by COCESNA (Central America), Cuba, and Trinidad and Tobago. Consequently, there is no effective availability of NOTAM information, much less of the rest of aeronautical information.

4. Situation after project implementation

If a regional project is established for the implementation of an AIS database system, all CAR/SAM States would be interconnected automatically; therefore, all of the aeronautical information required to directly support air operations would be available.

5. Existing documentation (from the manufacturer, the States, multinational organisations that have implemented it)

Only the aforementioned CAR/SAM States and organisations would be able to have technical documentation regarding a NOTAM data bank. EUROCONTROL should have the specifications and technical documentation on a regional AIS database system.

The basic operational requirements and the planning criteria of a regional automated AIS system can be found in the regional plan for the European Region, as well as in the CAR/SAM plan, in the report of the Third Regional Air Navigation Meeting, and in the GREPECAS documents.

6. Project input and output

Meet the regional requirements in terms of availability of aeronautical information.

Availability of aeronautical information/data for use by all aeronautical operators.

7. Description of users and how they benefit from the project (ANS, air traffic, others), price to charge, if applicable/cost savings.

All national and international operators, service providers, industry.

All would benefit directly from the availability of updated and timely aeronautical information about CAR/SAM States.

Prices can be established as a direct subscription to the service provided, and/or charged directly for the provision of air navigation services.

8. Quantification of demand through time (units in which the demand is expressed).

If this requirement refers to the demand of the system to be implemented, we might say that the current demand is immediate.

9. Reference to the optimum timing for start up.

As soon as possible

10. Project implementation phases and time required for each phase

Study, 2 MONTHS; international coordination, 3 MONTHS; price quotations for the equipment, 1 MONTH; securing of resources, 3 MONTHS; purchase, personnel hiring arrangements, 1 MONTH; training, 1 MONTH; purchase/leasing of office space, BY THE STATES TO WHICH THE RESPONSIBILITY IS ASSIGNED; installation, 3 MONTHS; start up, 1 MONTH; tests, 1 MONTH.

11. System requirements in the short/medium and long term.

By operational requirements, as soon as possible.

12. Organisational and institutional aspects of the project.

The project can only be implemented through a regional project, in which all States will make trust fund contributions.

13. Purchase value of the equipment, broken down by system component (at local and regional level).

This is a task that will have to be done as part of the study to be carried out by the consultant(s) hired to develop system specifications.

14. Useful life of each component

It is estimated that the useful life should be at least 15 years for all hardware elements, and at least 10 years for software elements.

15. Value of intangible assets of the project (software, system input data, technical/operational feasibility studies, training, tests.

This is a task that will have to be done as part of the study to be carried out by the consultant(s) hired to develop system specifications.

16. Appraised physical infrastructure (if applicable)

This is a task that will have to be done as part of the study to be carried out by the consultant(s) hired to develop system specifications.

17. Other investments: computers/printers, copying machines, office furniture, facsimile, etc.

This is a task that will have to be done as part of the study to be carried out by the consultant(s) hired to develop system specifications.

18. Staff required by specialty, based on operating hours of the system (H-24, H-12, on request, or other administrative schedule).

Up to each participating State.

19. Yearly salary of each (professional and technical) specialist, administrative and security personnel.

Up to each participating State.

20. Charges, medical insurance, income tax, and any other expenditure other than annual gross remuneration.

Up to each participating State.

21. Travel, *per diems*, extra hours.

Up to each participating State.

22. Operating expenses

This is a task that will have to be done as part of the study to be carried out by the consultant(s) hired to develop system specifications.

23. Interest rate on the debt (if applicable), if funding is through a loan.

This is a task that will have to be done as part of the study to be carried out by the consultant(s) hired to develop system specifications.

24. Conditions under which the project would be aborted

If the participating States do not make the contributions for which they are responsible.

25. Variation in demand forecasts

Demand for the system may gradually increase as users become acquainted with its benefits, convenience and profitability.

26.. Prices for the use of satellites and other system inputs

This will all be included in the future planning of GNSS and of the operational ATM.

27. Equipment prices

This is a task that will have to be done as part of the study to be carried out by the consultant(s) hired to develop system specifications.

28. Leasing *versus* buying

The equipment will have to be bought.

C. **IMPLEMENTATION OF THE SBAS PROJECT**

1. Situation if the project were in place.

This project continues its activities since they started in late 2001. The project consists of the installation of an SBAS augmentation platform for the CAR/SAM Regions and the conduction of trials to verify the degree of support that the system provides to air navigation operations. The installed platform is made up by 13 reference stations (Manaus, Curitiba, Recife, Brasilia, Rio de Janeiro, Santiago de Chile, Antofagasta, Balmaceda, Tegucigalpa, Bogotá, Lima, La Paz and Buenos Aires) and two master stations (Rio de Janeiro and Santiago de Chile). The function of reference stations is to capture GPS signals and identify possible errors in them, mainly due to the ionosphere. The GPS signal with errors is sent to master stations for the corresponding corrections. Once corrected, the information is sent without errors so that it can be used as a navigation tool. According to trials conducted to date, the system is supporting en-route and non-precision approach air navigation operations. In order for the system to also support vertical guidance approach operations, the data obtained from reference stations is being stored and processed with a view to the development of a mathematical model to correct GPS signals. Once completed, the model will be installed in reference stations. Currently, the augmentation system is practically fulfilling the information storage and processing function. Storage and processing is being done by the FAA Technological Centre in Atlantic City. The means of communication used to carry data from reference stations to master stations is the REDDIG.

2. Existing documentation (from the manufacturer, the States, multinational organisations that have implemented it)

RLA/00/009 project document

3. Detailed explanation of the scope of the project:

Develop a plan for the conduction of trials and the assessment of the technical/operational benefits of wide area augmentation systems (WAAS) in the CAR/SAM Regions, in order to assist in the establishment of the operational model for the satellite-based augmentation system to be developed by the GREPECAS ATM/CNS Subgroup.

4. Detailed description of the equipment, support infrastructure (local and regional), information required, and means to receive it.

The equipment included in the GNSS trial platform, at the TRS station level, consists of a GPS receiver (Astech or Trimble), a computer (Alpha DEC), a router (Cisco); at the master station level, there are routers and a computer.

5. Project input and output

The inputs are the data collected from reference stations, and the output is the processed data that will help in the development of a mathematical model to correct GPS signal errors in the equator caused by the ionosphere.

6. Description of users and how they benefit from the project (ANS, air traffic, others), price to be charged, if applicable/cost savings.

Once completed, the project will permit the collection of information about a possible SBAS augmentation platform in the CAR/SAM Regions. Users will be commercial and general aviation.

7. Time required for system operation

The system implemented by the project is only for trial purposes; system operation will require another platform, which will be defined upon completion of the project.

8. System requirements in the short/medium and long run

Based on trial results, the system would support en-route and non-precision approach operations, and is expected to support vertical guidance approach operations in the medium term.

9. Equipment purchase value

The equipment installed in Honduras, Colombia, Peru, Bolivia and Argentina is a loan from the FAA; the equipment installed in Chile and Brazil was purchased by the aeronautical administrations. The cost of a complete reference station is approximately US $100,000; of a master station, about US $200,000. This is only for trial purposes.

10. Useful life of each component

10 years

11. Value of intangible assets of the project (software, system input data), technical/operational feasibility studies, training, tests

The software currently installed in reference and master stations was provided by the United States free of charge. The cost of the new software that will permit the correction of GPS signals in CAR/SAM equatorial areas is almost one million dollars.

12. Appraised physical infrastructure (if applicable)

The approximate cost of the whole trial platform in project RLA/00/009 is US $1.8 million.

13. Prices for the use of communications or other system inputs

The means of communications used for carrying GPS signals from reference stations to the master station is the REDDIG. Data going to the United States uses a dedicated digital line from Rio de Janeiro to Atlantic City. The cost of this circuit is covered by Brazil.

APPENDIX B

1. DIGITAL AERONAUTICAL COMMUNICATION NETWORKS

1.1 Digital aeronautical communication networks, such as REDDIG and MEVA, implemented in the CAR/SAM Regions, are the answer to:

a) The need for a systematic implementation of the aeronautical fixed service (AFS) communications stipulated in the Air Navigation Plan.

b) The need to meet CNS communication requirements for the implementation of the CNS/ATM applications envisaged by ICAO, offering a high-quality service.

c) The need to modernise the aeronautical communication platform, with a view to a homogeneous implementation in all States.

d) The need to obtain better communication operating costs than those offered by communication providers.

e) The need for centralised management of communication systems, in order to maintain service quality at the level required by CNS/ATM applications for safety purposes.

1.2 The implementation of the MEVA network, in its current version, preceded that of the REDDIG, and met the basic requirements of the Air Navigation Plan. It was implemented mainly to support speech communications for ATS coordination, and to establish the asynchronous AFTN channels required by the Plan. It was subsequently extended to support circuits using the X.25 protocol. The REDDIG was conceived in a more general manner, as a multi-protocol/multi-service open network to support CNS requirements for the CNS/ATM applications of the Air Navigation Plan. Both are VSAT networks: MEVA is SCPC, and REDDIG operates in TDMA/Frame Relay with a back-up network (ISDN) which MEVA does not have. The MEVA II version is intended to be similar to the REDDIG, and is in the process of implementation.

1.3 Both networks have significantly improved communication services in the CAR and SAM Regions, with cost-benefit ratios that are quite favourable for the States/Organisations that operate in these network environments. In the case of the REDDIG, it might be said that, in average, the cost-benefit ratio is 4.0 for the States, considering conditions prevailing in 1998, when all CAR/SAM States leased communication services from public/private carriers. In one case (Argentina), the investment was recovered in one year, within the useful life of the project, estimated in 10 years (until 2011).

1.4 In addition to the MEVA and REDDIG networks, there are other digital networks, such as the COCESNA network, the Colombian network, the E/CAR network, which are being gradually interconnected. Trinidad and Tobago recently approved the turnkey purchase of a REDDIG node, which will serve as an interface with the E/CAR sub-region and the REDDIG.

1.5 The interconnection of the digital networks will provide a network environment that will permit CNS/ATM applications to perform intra-/inter-scenario operations. In other words, if the decision is made to implement an ATFM application in the CAR Region and another one in the SAM Region, the interconnection of the digital networks will permit the air traffic flow management units (FMUs) of both Regions to be connected. The same can be done with other options and other applications.

2. GNSS augmentation/SBAS augmentation system in the CAR/SAM Regions

2.1 Introduction

2.1.1 SBAS augmentation trials have been conducted in the CAR/SAM Regions since early 2002. These trials have been carried out through two ICAO technical cooperation projects: RLA/00/009 and RLA/03/902. In project RLA/00/009, trials involved an SBAS augmentation platform based on the WAAS augmentation systems of the FAA. Trials in project RLA/03/902 are based on the European EGNOS-type augmentation systems.

2.1.2 The activities carried out under these two projects have generated the following important conclusions:

a) Through project RLA/00/009, it has been possible to determine that an augmentation platform with master stations that have connection algorithms identical to those of the master stations in the WAAS augmentation platform can support en-route and non-precision approach operations. Likewise, when ionospheric conditions show little activity, it has been possible to support APV-type navigation operations.

b) Trials conducted under project RLA/03/902 for a two-month period in mid-2004 showed that it was possible to guarantee navigation operations up to APV1 during said period. Trials were carried out only in the northern and central parts of the Caribbean, and during a period of time when ionospheric activity was normal.

2.2 SBAS configuration in the CAR/SAM Regions

2.2.1 Although it would be advisable to implement an SBAS system for both the CAR and SAM Regions, we should not discard the possibility for each Region to have its own augmentation system. In case of having a CAR/SAM system, the SBAS system in the CAR Region would be made up by all the States, except Mexico, since that country would be part of the WAAS augmentation system of the FAA.

2.2.2 Although GREPECAS is developing the CAR/SAM GNSS augmentation plan within the CNS Committee of the ATM/CNS Subgroup, for illustration purposes, and based on the data obtained during the trial period, a possible CAR/SAM SBAS configuration that would ensure en-route and non-precision approach operations, possibly up to APV1 operations, is presented here. The SBAS augmentation system would be made up by 13 reference stations, 2 master stations, 2 satellite-link stations, at least 2 geostationary satellites for broadcasting, and a real-time monitoring system to ensure and permit the operation of the SBAS system in the CAR/SAM Regions.

2.2.3 This CAR/SAM SBAS augmentation platform would be fully warranted if implemented in the short run, no later than 2008, before the operational start up of the second protected civil frequency (L5) and the start up of another global positioning satellite constellation (Galileo), scheduled for 2014.

2.2.4 The estimated cost in US dollars of the aforementioned CAR/SAM SBAS augmentation platform is shown below, based on data obtained by project RLA/00/009. This cost includes the implementation and operation of the platform for a period of 10 years.

EQUIPMENT TO BE INSTALLED	ESTIMATED COST PER STATION (DOLLARS)	QUANTITY	TOTAL ESTIMATED COST
Reference station Configuration P/A	450,000	13	5,050,000
Master stations P/A	700,000	2	1,400,000
Satellite-link station P/A	8,000,000	2	16,000,000
SBAS operation monitoring and forecast system	2,000,000	1	2,000,000
Rental of space segment for two geostationary satellite stations.*	1,000,000	1	1,000,000
Communication cost	1,000,000	1	1,000,000
Training	500,000		500,000
Civil works	500,000	1	500,000
System installation	3,550,000	1	3,550,000
System maintenance and update	2,000,000	1	2,000,000
Administrative and personnel expenses	7,000,000	1	7,000,000
		Total	40,000,000

2.2.5 To make a gross estimate of total benefits and investment recovery, we will only consider those resulting from the substitution of the conventional system in the CAR/SAM Regions. In this respect, and according to Communication Lists 1 and 2 published in the webpage of the Regional Offices, approximately 765 NDBs, 525 VORs, 475 DMEs, and 170 ILSs are currently installed. The average cost of this equipment, with dual configuration and turnkey contracts, is as follows:

NDB	50,000	dollars
VOR	250, 000	dollars
DME	150,000	dollars
ILS	600,000	dollars

2.2.6 The SBAS system to be implemented would be a primary navigation system, supported mainly by ground equipment (DME and ILS). Starting in 2008, this system will gradually replace the services provided by VORs and NDBs. Based on the planning criteria of the Air Navigation Plan, it is advisable to consider only one portion of the 765 NDBs. In this sense, half of that amount, that is, 382, would be taken into account, since it is possible that many NDBs will be already dismantled by 2008.

* Only one geostationary satellite is currently available in the CAR/SAM Regions.

2.2.7 Starting in 2008, there would be a transition period in which both navigation systems would coexist. This could be a 10-year period, during which the 525 VORs and the 382 NDBs would be phased out, without being replaced, based on their useful life. Since it is difficult to know the age of the equipment, we will assume that 6 % of this equipment, that is 23 NDBs and 32 VORs, will be dismantled in a linear progression every year up until 2018, generating US $9,150,000 in annual savings, in current figures. Based on this, the investment made in the CAR/SAM SBAS system would be recovered in little less than 4 years. A detailed cost-benefit study, using the net present value (NPV) method, could give different figures, but in no way would they invalidate the economic viability of an investment project for a CAR/SAM SBAS. It is important to note that this approach of replacing conventional navigation systems with the GNSS was the strongest part of the cost-benefit study carried out by the FANS Committee.

3. Air traffic flow management (ATFM)/AIS automation

3.1 The implementation of air traffic flow management calls for the deployment of CNS/ATM technologies in the CAR/SAM Regions to meet the operational requirements to be defined for these Regions. These requirements will permit the CAR/SAM States/Organisations to make decisions on the technical/operational aspects, and to define the activities to be carried out for the implementation of a plan in this regard.

3.2 The ATM Committee of the ATM/CNS Subgroup is studying this matter through a specific task force. This task force is expected to address these operational aspects, and to define the time frames required to meet them as they relate to the ATFM.

3.3 Based on the ATM operational concept, ICAO is planning operational initiatives that will be included in a roadmap, which takes into account the opinion of the aeronautical industry. This roadmap is shown in Appendix B to working paper 2 (WP/2) of this meeting. These initiatives contemplate strategic aspects of the ATM operational concept, related to the ATFM, such as: airspace organisation and management, balance between demand and capacity, conflict management, as well as joint decision-making techniques. The new version of the Global Air Navigation Plan for CNS/ATM Systems will contain a model of a planning process, which, in one of its stages, and for the concrete case of the ATFM, would have to define the required capabilities, including those related to ground systems for ATM applications, CNS requirements, information transfer requirements, and others. After defining these capabilities, a concrete ATFM project can be established to develop the aspects mentioned in Appendix A to this working paper, based on the data obtained during the planning process.

3.4 That stated for the ATFM is also applicable to the services to be implemented using AIS automation. The aforementioned roadmap contains an operational initiative called Improvements in the Exchange of Information, which is related to the AIS under an automated system.

Agenda Item 4: Future work of the Task Force

4.1 Under this agenda item, the meeting reviewed its future work programme and composition. In this respect, the following was agreed:

Work programme

4.1.1 The Task Force reviewed Appendix K to the report on agenda item 5 of the GREPECAS/12 meeting, and concluded the following:

a) There are tasks, like TF-IA/1, that should await the new edition of the Global Plan for the Implementation of CNS/ATM Systems.

b) Emphasis should be placed on the legal aspects, the development of guidance material on the topic, the need to assign a higher priority to the task, and its completion date.

c) In the opinion of the group, and subject to the decision of GREPECAS, TF-IA/2 has been completed.

d) Taking into account the level of progress made in the conduction of cost-benefit studies, the completion date for the task needs to be extended.

e) There is a need to create a new task to enhance the Strategy for Regional Implementation of Multinational Facilities/Services.

4.1.2 Based on the above, the following draft decision was developed for consideration by GREPECAS:

DRAFT
DECISION 2/4 - AMENDMENT OF THE WORK PROGRAMME OF THE INSTITUTIONAL ASPECTS TASK FORCE

That the GREPECAS/13 meeting consider the new work programme of the Institutional Aspects Task Force, which appears in Appendix A to this part of the report, for its approval.

APPENDIX A

INSTITUTIONAL ASPECTS TASK FORCE

1. **Terms of reference**

a) Considering the new ATM operational concept approved by the Eleventh Air Navigation Conference as the global framework for the implementation of ATM systems, review the actions adopted by the ICAO Council and by some States in relation to the institutional aspects for the implementation of the aforementioned systems in the CAR/SAM Regions.

b) Suggest ways of assisting CAR and SAM States that so require, in the conduction of cost-benefit analyses, and of economic, financial, legal, and administrative studies related to their technical and operational projects for the implementation of CNS/ATM systems.

c) Analyse those aspects of the CAR/SAM Regional Air Navigation Plan that require multinational arrangements.

2. **Work programme**

TASK NUMBER	TASK DESCRIPTION	PRIORITY	DATE	
			BEGINNING	COMPLETION
TF-IA/1	Taking into account the new ATM operational concept, develop guidance and implementation proposals for the CAR/SAM Regions regarding the global actions adopted by the ICAO Council and by some States concerning institutional aspects.	B	As of the new edition of the CNS/ATM Global Plan	
TF-IA/2	Identify, in keeping with the CAR/SAM Air Navigation Plan, scenarios and the corresponding elements that require multinational institutional arrangements for their implementation.	A		Completed
TF-IA/3	Develop regional guidelines to assist CAR/SAM States in the conduction of cost-benefit analyses for the institutional arrangements of the multinational facilities identified.	A		2007
TF-IA/4	Develop financial, administrative, and other relevant arrangement proposals for the hiring of services for the implementation of multinational ATM systems.	A	Progress needs to be made on Taks TF-IA/3	
TF-IA/5	Identify the elements that require legal arrangements for the institutional aspects identified in the previous item, and provide guidance to facilitate their implementation.	A		2007
TF-IA/6	Based on the available material, develop an implementation strategy for multinational facilities.	A	2006	2007
TF-IA/7	Find the best way to present multinational facilities in the FASID to facilitate their identification, description, and processing of future amendments.	B		2007

3. **Composition**

Argentina, Brazil, Chile, Colombia, Cuba, Peru, United States,Venezuela and COCESNA.

4. **Rapporteur**

Argentina

Agenda Item 5: Other matters

5.1 The *Ad-hoc* Group on Legal Matters presented to the Task Force its work on the development of legal guidance material for the drafting of an instrument creating a regional multinational organisation (RMO). The material was discussed extensively, and after making some corrections to it, the agreement was reached to submit it to the consideration of GREPECAS for its dissemination among States/International Organisations, with the idea, on the one hand, to create interest on this matter and get ready for the discussion of the creation of regional multinational organisations (RMOs) and, on the other, to foster a more effective and efficient work on TF-IA/5 by the Task Force.

5. 2 In this respect, the Task Force formulated the following draft conclusion to be submitted to the consideration of GREPECAS:

DRAFT
CONCLUSION 2/5 - LEGAL GUIDANCE MATERIAL

That GREPECAS examine the legal guidance material, which is attached as Appendix A to this part of the report, for its dissemination by the ICAO Regional Offices to States/Territories and International Organisations.

5.3 The Task Force felt the need to hold a new meeting in 2006, concurrently with another Seminar on Institutional Aspects, in the same modality as the one applied to date. In this respect, the significant cooperation provided by regional technical cooperation project RLA/98/003 to the CAR/SAM Regions was greatly acknowledged.

5.3.1 Due to the complexity of the institutional matters to be addressed, the Group considered that, in the future, meetings should last 3 days, and seminars, at least 2 days.

APPENDIX A

LEGAL GUIDANCE MATERIAL FOR DRAFTING A DOCUMENT FOR THE CREATION OF A REGIONAL MULTINATIONAL ORGANISATION (RMO)

REFERENCES:

**Report of the 29th session of the Legal Committee (Montreal, 4-15 July 1994)(Doc. 9630).*
**Report of the first meeting of the Establishment of a GNSS legal framework panel (Montreal, 25-30 November 1996).*
**Report of the second meeting of the Establishment of a GNSS legal framework panel (Montreal, 6-10 October 1997).*
**Report of the third meeting of the Establishment of a GNSS legal framework panel (Montreal, 9-13 February 1998).*
**Resolution A32-19, Letter on State rights and obligations regarding GNSS services.*
**Resolution A32-20, Development and drafting of an appropriate long-term legal framework for GNSS implementation.*
**Final report on the work of the CNS/ATM Legal Aspects Study Group of the ICAO Secretariat, approved at the 171st session of the Council, on 5 March 2004.*
**Resolution A35-15, Revised statement of ICAO ongoing policies and methods concerning a global air traffic management (ATM) system and the air traffic communication, navigation, and surveillance/air traffic management (CNS/ATM) systems (September-October 2004)*

1. In order to facilitate the establishment of a Regional Multinational Organisation (RMO), the GREPECAS Institutional Aspects Task Force has prepared this high-level guidance material.

2. In this respect, the instrument of incorporation should be made up of an Agreement and Annexes. The Agreement should include the basic, main and essential provisions concerning the general obligations of States, and the organisation or institutional structure. The Annexes should cover the dynamic aspects, that is, the technical-operational aspects related to the existing and future CNS/ATM systems, in keeping with ICAO standards and recommended practices.

3. As to the critical criteria related to national sovereignty, national security, and safety, it would be necessary to establish safeguards to ensure that the level of authority and control by the States over their airspaces will not be affected, in keeping with the documents mentioned in the References.

4. The basic or general clauses that should be included in the cited instrument are as follows:

a) Purpose of the instrument: The rationale for the joint decision by States to create the multinational facility.

b) A clear and precise definition and description of the facility and of the functions it will perform, and, if applicable, the functions that it will not perform.

c) Legal capacity: The appropriate one for the fulfilment of its work must be identified.

d) Liability and insurance: Aspect related to the previous one, which involves determining the extent to which it must be assumed and the way in which it will be assumed.

e) Obligations of the participating States: The basic obligations include:

1) Creating the RMO.

2) Contributing its share of capital and goods.

3) Following ICAO criteria, principles and practices.

4) Meeting the established technical requirements.

f) Management, which includes:

1) Governing and administrative bodies: The nature and functions of these bodies must be defined.

i) Board of Directors, Council, or Governing Board, made up by a representative of each of the Member States. It will elect a Chairperson from its own members, on a rotation basis.

ii) General Manager or Executive Director, designated by the Board of Directors, Council, or Governing Board.

2) Decision-making modalities: Type of vote and decision (unanimous, and qualified or simple majority).

g) Structure and staffing: Considers nationality, numbers, selection, categories, working conditions, by-laws to be applied, retirement payments and occupational risk coverage.

h) The financial aspects, taking into account the economic and financial autonomy that the organisation will enjoy, include:

1) Implementation costs to reach the operational phase.

2) Cost determination.

3) Cost distribution (portion corresponding to each State).

4) Cost recovery.

5) Budgeting: Income and costs or expenses must be estimated in advance, in order to keep an appropriate financial control.

6) Budget approval power (generally corresponds to the governing body).

i) Term or duration: limited, with automatic renewal. Both periods must be predefined.

j) Audit: It is a sign of good financial management, reason why an annual audit by an external auditor should be scheduled. It should also undergo the safety audits foreseen by ICAO.

k) Tax exemption or fiscal immunity.

l) Jurisdictional immunity: By virtue of this clause, which is very common in instruments of incorporation of similar international organisations, the RMO, its goods and resources, as well as its personnel, would enjoy jurisdictional immunity, that is, the courts of member States would not be able to try cases initiated by a State or third party against the RMO.

m) Conflict settlement procedure: Negotiation or arbitration procedures should be agreed upon, as well as the instance to which they can appeal to obtain an absolute rule.

n) Amendment.

o) Registration in the ICAO Council, according to Art. 83 of the Convention on International Civil Aviation (Chicago 1944).

p) Final provisions: effective date, ratification, accession, denouncement and dissolution.