International Civil Aviation Organization
North American, Central American and Caribbean Office
Third MEVA II / REDDIG Coordination Meeting (MR/03)
Mexico City, Mexico 26 to 28 July 2006

MR/03-WP/03
30/06/06

Agenda item 2: Technical-operational and cost-benefit option analyses for the MEVA II and REDDIG networks integration/interconnection

OPTION PROPOSALS FOR THE INTEGRATION AND INTERCONNECTION OF THE VSAT MEVA II AND REDDIG NETWORKS

(Presented by the Secretariat)

SUMMARY

This working paper presents for the consideration of the Meeting the option proposals for the integration or interconnection to achieve the interoperability of the VSAT MEVA II and REDDIG networks that have been developed by the MR/2 and MR/TF/1 Meetings.

References:

- MEVA II / REDDIG Coordination Meeting (Lima, Peru, 20 to 22 March 2006)
- MEVA II/ REDDIG Interconnection Task Force Meeting (Mexico City, Mexico, 3 to 5 May 2006).

1. Introduction

1.1 Based on the Report of the Second MEVA II / REDDIG Coordination Meeting (MR/2), held in Lima, from 20 to 22 March 2006; on the Report of the MEVA II/ REDDIG Interconnection Task Force Meeting (MR TF/1), held in Mexico City from 3 to 5 May 2006; and also, in accordance to the progress achieved at these Meetings, the Secretariat has prepared this working paper describing technical options and the cost-benefit analysis for the integration and interconnection of the aforementioned networks, which are contained in the Report to Agenda Items 1 and 2 of the MR TF/1 Meeting.

2. VSAT MEVA II and REDDIG networks homogeneous integration option

2.1 The MR TF/1 Meeting thoroughly discussed the technical-operational study of Option 1 for the homogeneous integration of MEVA I and REDDIG Networks, including the cost/benefit analysis, the definition of the necessary resources, the elaboration of proposals for the operation, control of the required services and other related aspects in order to achieve this objective.

2.2 The Task Force indicated that the integration option would allow the interoperability of the VSAT MEVA II and REDDIG networks in an homogeneous form, that is like if there was only one VSAT network without the need to implement other mean of communications for the interconnection.

2.3 This integration would be facilitated due to the fact that the MEVA II VSAT Network shall be developed under a full mesh topology network using TDMA/Frame Relay satellite access, PAS 1R satellite with a beam over United States/Latin America, C-band operation frequencies and vertical linear polarization. The main technical characteristics of the MEVA II are of the same type of the VSAT REDDIG network. Additionally, the MEVA II network would be using similar and compatible equipment with as with REDDIG, such as the FRAD and MODEM satellites, contributing even more to the homogeneous integration of the two networks.

2.4 The Task Force proposed two phases for the homogeneous integration of the VSAT MEVA II and REDDIG Networks:

a) *Initial Phase: Develop a Memorandum of Understanding between REDDIG and the COCESNA and CAR/NAM State, meanwhile the MEVA II first contract lasts with AGS, with the objective to establish different levels of this American Integrated Network organization and the involved responsibilities, maintaining the actual service providers.*

b) *Consolidation Phase: Consists in the creation of a Multiregional Organization (OMR) integrated by the States/Territories/International Organizations Members of the networks, to hire the operation and "outsourcing" services of the telecommunications integrated network to only one service provider entity.*

2.5 Also, the MR TF/1 Meeting recommended the initial general techniques for the homogeneous integration of the VSAT MEVA II and REDDIG networks: The two MEVA II VSAT network are develop under a Full Mesh topology, using TDMA/Frame Relay satellite access, as well as the transponder use in PAS 1R satellite with a beam directed over United States / Latin America, frequency operation in C band and linear vertical polarization. In addition the following particular premises:

a) Network Management Centre
- Equipment redundancy with hemispheric geographical diversity.
- MRT and AMRT use with geographical diversity to avoid solar interference.
- Dedicated circuit between MRT and AMRT.
- 24x7x365 operation of the network management centre in English, Spanish and Portuguese.
- Use of up to 1.25 Msps carriers with QPSK and FEC 1/2 modulation.
- Establishment of three user groups: NAM/CAR, SAM and NAM/CAR-SAM.
- 99.95% minimum availability.
- The network is exclusive and closed for all member States, and should not be interconnected with any public network.

b) Remote nodes
- Redundant equipment desirable.
- 99.95% minimum availability.
- BER equal or more than 10^{-6}.

2.6 Furthermore, the Task Force determined the incorporation of additional electronic cards necessary to perform the implementation of the REDDIG nodes according to the expressed as follows:

a) Colombia: FOUR (4) digital voice modules.

b) Ecuador: TWO (2) digital voice modules.

c) Venezuela: FOUR (4) Analogue voice cards.

2.7 In respect to the MEVA II nodes, considering that with the exception of COCESNA 's node, the MEVA II Members have leased the equipment of their nodes, the determination of the additional electronic cards only concerned to the MEVA Service Provider and to COCESNA.

Cost/benefit analysis

A. Costs

2.8 To carry out the traffic study and determine the use of the satellite segment, THREE (3) user groups were established:

a) Group "A" for communications between the NAM-CAR Regions.
b) Group "B" for communications in the SAM Region.
c) Common Group "C" for communications between NAM-CAR/SAM Regions.

2.9 The cost of REDDIG referred to the following aspects:

a) One Time Charge.

a.1) Group "A"

a.1.1) Equipment refers to additional implementations for the indicated nodes.

a.1.2) Installation and operation of additional equipment.
Estimate cost = US$ 3.500

b) Monthly or Annual Recurring Charges.

b.1) Group "B"

b.1.1) Network Operations Center.

b.1.2) Spare parts support, maintenance and logistics (Outsourcing).
Annual Budget Group "B" 2006 (b.1.1 + b.1.2)

b.1.3) Satellite Segment (Bandwidth).
Annual Budget Group "B" 2006

b.2) Group "C"

b.2.1) Network Operations Centre.

b.2.2) Spare parts support, maintenance and logistics (Outsourcing). Annual Budget Group "C" 2006 (b.2.1 + b.2.2) = included within the costs expressed in b.1.2)

b.2.3) Satellite Segment (Bandwidth). Estimate Annual Budget Group "C"

2.10 The REDDIG and MEVA II costs are presented in the Table contained in **Appendix A** to this working paper.

B. Benefits per cost savings

2.11 The current links implemented are expressed as follows:

a) Brazil / USA
b) Peru / USA
c) Ecuador / COCESNA
d) Colombia / COCESNA
e) Venezuela / San Juan
f) Colombia / Panama
g) Colombia / Jamaica
h) Colombia / Curacao
i) Venezuela / San Juan
j) Venezuela / Aruba
k) Venezuela / Curacao

2.12 The annual costs of the mentioned links are: US$ 279.320 X 2 equals to US$ 558.640.

2.13 The Member from Brazil informed that their State will present a proposal of amendment to the FASID to eliminate the Brazil / United States AFTN circuit requirement.

C. Cost/Benefit

2.14 Considering the relevant the costs analysis and the benefits obtained by the links to be disconnected, and on the basis of a 5-year horizon in MEVA II contract with a 12% discount rate, a positive value is obtained which renders this option profitable, as shown in Appendix A to this paper.

Conclusion

2.15 Based on the results of the analysis carried out, the Task Force meeting agreed that the total homogeneous integration/interoperability solution is viable, therefore formulated the following Draft Conclusion:

DRAFT
CONCLUSION 1/1 ***TECHNICAL OPERATIONAL AND COST-BENEFIT FEASIBILITY OF THE MEVA II / REDDIG HOMOGENEOUS INTERCONNECTION /INTEROPERATION SOLUTION***

That, based on the analysis carried out the total homogeneous interconnection/interoperation solution of the VSAT MEVA II and REDDIG networks:

a) from the technical-operational point of view and in accordance with the cost/benefit analysis results contained in this part of the Report, is feasible and would report important benefits to provide the communications for the air navigation systems/services performance between NAM, CAR and SAM Regions; and

b) a initial stage could be transitory to achieve the consolidation, which would be the final target of both networks for the integration process, however, to achieve its implementation the pertinent institutional arrangements should be adopted which are dealt under the Agenda Item 3 to this Report.

3. Options for the integration/interconnection of the VSAT MEVA II and REDDIG networks

3.1 The Task Force Meeting thoroughly discussed the technical-operational study of Option No. 2 indicated by the MEVA II / REDDIG Coordination Meeting for the interconnection/interoperability between nodes requiring it and reach one partially homogeneous solution between the MEVA II and REDDIG Networks, including the definition of the necessary resources and the development of proposals for the operation and necessary control services and other related aspects in order to achieve this solution.

3.2 The Task Force recommended the general techniques premises for the partially homogeneous interconnection/interoperability of the VSAT MEVA II and REDDIG networks: The two MEVA II VSAT network are develop under a Full Mesh topology, using TDMA/Frame Relay satellite access, as well as the transponder use in PAS 1R satellite with a beam directed over United States / Latin America, frequency operation in C band and linear vertical polarization, as well as the following premises:

c) Network Management Centre
- Equipment redundancy with hemispheric geographical diversity.
- MRT and AMRT use with geographical diversity to avoid solar interference.
- 24x7x365 operation of the network management of each centre.
- 99.95% minimum availability.
- The networks are exclusive and closed for all Member States, Territories and International Organization and should not be interconnected with any public network.

d) Remote nodes
- Redundant equipment is desirable.
- 99.95% minimum availability.
- BER equal or more than 10^{-6}.

3.3 Furthermore, the Task Force noted the possible technical configurations for this MEVA II / REDDIG interconnection/interoperability. In this respect three options of partially homogeneous interconnection/interoperability were considered:

Option A: Addition of MEVA II Linkway MODEMS and other devices involved in REDDIG nodes.

Option B: Addition of REDDIG Linkway MODEMS and other devices involved MEVA nodes.

Option C: Addition of Linkway MODEMS and other devices in a combined form in the two networks.

3.4 Regarding the three above-mentioned options, the Meeting noted that these were mainly based in the following aspects; Option A through the installation of the MEVA II Linkway MODEMS in the REDDIG nodes of Brazil, Colombia, Ecuador, Peru and Venezuela; Option B through the implementation of REDDIG Linkway MODEMS in the MEVA II nodes in Aruba, Curacao, COCESNA (Honduras), Jamaica, Panama and Puerto Rico and finally Option C involving the installation of MEVA II MODEMS in the REDDIG nodes of Colombia and Venezuela and the REDDIG MODEMS installation in the MEVA II nodes of COCESNA, Miami and Puerto Rico.

3.5 With the implementation of the REDDIG in the MEVA II node in Miami and Puerto Rico, the Task Force took note that the FAA security requirements should be considered which are mentioned in Agenda Item 3 of this Meeting.

3.6 Additionally, the Meeting analyzed for each afore mentioned options the additional equipments to be installed in the corresponding MEVA II / REDDIG nodes, the administrative arrangements to carry out the control and supervision, the space segment arrangements, the maintenance, the spare parts managements and the cost-benefit analysis of the three options. To this respect, **Appendix B** to this working paper presents the additional equipments list to be installed in each of the options. This Appendix shows the results of the cost-benefit analysis carried out for each option. The administrative aspects of each option developed by the Task Force are dealt with in Agenda Item 3 of this Meeting.

3.7 As a result of the option's analysis indicated in paragraph 3.3 to this paper, the meeting considered that Option C represented the best technical configuration since it reflects the best cost-benefit. The aforementioned is shown in **Appendix C** to this working paper.

3.8 In the analysis of the options the Task Force considered the relevant costs of the analysis of costs' and the benefits obtained by links that will be disconnected on the basis of a 5-year horizon in the MEVA II contract with a 12% interest rate, a positive value is obtained which renders in Option C (see Appendix C).

3.9 Moreover, the Task Force Meeting considered that if Option C is implemented, it would be necessary to elaborate procedures for the coordination of operative maintenance work in those MEVA II nodes installed with REDDIG MODEMs, as well as those nodes of the REDDIG that would have installed MEVA II MODEMs with the purpose to expedite such operations.

3.10 Based in all this analysis, the MR TF/1 Meeting formulated the following Draft Conclusion:

DRAFT
CONCLUSION 1/2: PROPOSALS FOR THE VSAT MEVA II / REDDIG NETWORKS PARTIALLY HOMOGENEOUS INTEGRATION / INTEROPERATION

That, based on the results of the technical-operational feasibility studies and the cost-benefit analysis, a partially homogeneous solution that could be transitory can be implemented to achieve the consolidation target of the MEVA II and REDDIG networks,

a) through the adoption of Option C described in this part of the report; and

b) by adopting administrative-operational arrangements to satisfy the premise of this type of solution also describes in this part of the Report, taking into account the factors involved.

4. Discussion

4.1 The Meeting should review the studies presented in sections 2 and 3 of this working paper in order to adopt a technical option of integration or interconnection of the VSAT networks or another alternative it deems to be appropriate.

4.2 Additionally, the Meeting should complete and thoroughly study Alternative No. 1, specifically the cost impact for Members due to the integrated management of the networks; the MEVA II Service Provider is expected make contributions for this. Regarding Alternative No. 2, the Meeting should also thoroughly study regarding the procedures that need to be implemented between the MEVA II Service Provider and the REDDIG Administration in order to operate and maintain the interconnection solutions. Furthermore, it is necessary to have more details regarding the cost impact that results from the interconnections between the Miami and San Juan nodes, among others.

4.3 Furthermore, the Meeting should keep into account that in order to implement the technical option adopted by this Meeting, as mentioned in the previous paragraph, it would be necessary to adopt and apply administrative/institutional aspects; this is dealt under Agenda Item 3 of this Meeting.

5. Suggested action

5.1 The Meeting is invited to:

a) take note of the information contained in this working paper;

b) review the study of the option to integrate the MEVA II and REDDIG networks presented in section 2, including Appendix A to this paper;

c) review the study of the option to interconnect the MEVA II and REDDIG networks presented in section 3, including Appendixes B and C to this paper;

d) based on the results from the revisions described in items b) and c) above and taking into consideration paragraphs 4.2 and 4.3 of this paper, the Meeting should adopt one of the technical options of integration or interconnection of the MEVA II and REDDIG networks to achieve their interoperability; and

e) consider and adopt other actions deemed appropriate.

- - - - - - - -

APPENDIX A

	1	2	3	4	5
SATELLITE SEGMENT REDDIG COST					
REDDIG Costs	*112,620*	*112,620*	*112,620*	*112,620*	*112,620*
MEVA Costs	*29,820*	*29,820*	*29,820*	*29,820*	*29,820*
DEDICATED LINE COST	*36,000*	*36,000*	*36,000*	*36,000*	*36,000*
TOTAL COSTS	***178,440***	***178,440***	***178,440***	***178,440***	***178,440***

5 nodes	Colombia	Cost Average	1,877	22,524
	Venezuela		1,877	22,524
	Ecuador		1,877	22,524
	Brasil		1,877	22,524
	Peru		1,877	22,524
				112,620

DEDICATED LINES COST SAVING BENEFITS					
Brasil/USA	*24,000*	*24,000*	*24,000*	*24,000*	*24,000*
Peru/USA	*88,000*	*88,000*	*88,000*	*88,000*	*88,000*
Ecuador/COCESNA	*60,000*	*60,000*	*60,000*	*60,000*	*60,000*
Colombia/COCESNA	*75,600*	*75,600*	*75,600*	*75,600*	*75,600*
Venezuela/San Juan	*44,000*	*44,000*	*44,000*	*44,000*	*44,000*
Colombia/Panama	*70,800*	*70,800*	*70,800*	*70,800*	*70,800*
Colombia/Jamaïca	*96,000*	*96,000*	*96,000*	*96,000*	*96,000*
Colombia/Curaçao	*48,000*	*48,000*	*48,000*	*48,000*	*48,000*
Venezuela/Aruba	*26,136*	*26,136*	*26,136*	*26,136*	*26,136*
Venezuela/Curaçao	*26,136*	*26,136*	*26,136*	*26,136*	*26,136*
TOTAL COST SAVINGS	***558,672***	***558,672***	***558,672***	***558,672***	***558,672***

7 nodes	COCESNA	Cost Average	355	4,260	
	Aruba		355	4,260	
	Curacao		355	4,260	
	Panama		355	4,260	
	Jamaica		355	4,260	
	USA		355	4,260	
	PR		355	4,260	
				29,820	

NET BENEFIT	***380,232***	***380,232***	***380,232***	***380,232***	***380,232***

INVESTMENT	
MEVA II Memotec extra cards (budgetary)	-6,000
04 Digital voice Modules E1 DIM	
02 Digital voice Modules E1 DIM	
04 Analog voice Cards	
	-9,500
Installation and execution	*-3,500*
TOTAL INVESTEMENT	***-19,000***
VAN	**1,206,831**

APPENDIX B

INVESTMENT FOR ADDITIONAL EQUIPMENT FOR OPTIONS A, B AND C OF A PARTIAL HOMOGENEOUS INTERCONNECTION/INTEROPERABILITY

OPTION A

REDDIG Nodes

Brazil
Two (2) MODEM Linkway with (1) Interface FR;
Two (2) L Band splitters/combinators and integration material: and
Two (2) SSPA de ***75*** W in the event the link budget for the transmission of two simultaneous carriers confirms it.

Colombia
Two (2) MODEM Linkway with (1) Interface FR;
Two (2) L Band splitters/combinators and integration material: and
Two (2) SSPA de ***75*** W in the event the link budget for the transmission of two simultaneous carriers confirms it.
Four (4) digital voice modules in El DIM card (Equipment MEMOTEC CX950)

Ecuador
Two (2) MODEM Linkway with (1) Interface FR;
Two (2) L Band splitters/combinators and integration material: and
Two (2) SSPA de ***75*** W in the event the link budget for the transmission of two simultaneous carriers confirms it.
Two (2) digital voice modules in El DIM. (Equipment MEMOTEC CX950)

Peru
Two (2) MODEM Linkway with (1) Interface FR;
Two (2) L Band splitters/combinators and integration material: and
Two (2) SSPA de ***75*** W in the event the link budget for the transmission of two simultaneous carriers confirms it.

Venezuela
Two (2) MODEM Linkway with (1) Interface FR;
Two (2) L Band splitters/combinators and integration material: and
Two (2) SSPA de ***75*** W in the event the link budget for the transmission of two simultaneous carriers confirms it.
Four (4) Analogue voice Cards. (Equipment MEMOTEC CX950)

MEVA II Nodes

COCESNA
One analogue voice Card. (Equipment MEMOTEC CX960)

Puerto Rico
One analogue voice Card. (Equipment MEMOTEC CX960)

Panama
Four analogue voice channels (Equipment MEMOTEC CX960)
One AFTN data channel. (Equipment MEMOTEC CX960)

Aruba
One analogue voice Card. (Equipment MEMOTEC CX960)

Curacao
One analogue voice Card. (Equipment MEMOTEC CX960)
One multi I/O V24 Card. (Equipment MEMOTEC CX960)

Jamaica
One analogue voice Card. (Equipment MEMOTEC CX960)

OPTION B

MEVA II Nodes

COCESNA
Two (2) MODEM Linkway with (1) Interface FR;
Two (2) L Band splitters/combinators and integration material: and
Two (2) SSPA de ***75*** W in the event the link budget for the transmission of two simultaneous carriers confirms it.
One analogue voice Card. (Equipment MEMOTEC CX. 960)
One I/0 universal Card. (Equipment MEMOTEC CX. 960)

Puerto Rico
Two (2) MODEM Linkway with (1) Interface FR;
Two (2) L Band splitters/combinators and integration material: and
Two (2) SSPA de ***75*** W in the event the link budget for the transmission of two simultaneous carriers confirms it.
One analogue voice Card. (Equipment MEMOTEC CX. 960)
One I/0 universal Card. (Equipment MEMOTEC CX. 960)

Panama
Two (2) MODEM Linkway with (1) Interface FR;
Two (2) L Band splitters/combinators and integration material: and
Two (2) SSPA de ***75*** W in the event the link budget for the transmission of two simultaneous carriers confirms it.
Four analogue voice channels (Equipment MEMOTEC CX. 960)
One multi I/O Card. (Equipment MEMOTEC CX. 960)
One I/O universal Card. (Equipment MEMOTEC CX. 960)

Aruba
Two (2) MODEM Linkway with (1) Interface FR;
Two (2) L Band splitters/combinators and integration material: and
Two (2) SSPA de ***75*** W in the event the link budget for the transmission of two simultaneous carriers confirms it.
One analogue voice Card. (Equipment MEMOTEC CX. 960)

One I/0 universal Card. (Equipment MEMOTEC CX. 960)

Cucacao
Two (2) MODEM Linkway with (1) Interface FR;
Two (2) L Band splitters/combinators and integration material: and
Two (2) SSPA de ***75*** W in the event the link budget for the transmission of two simultaneous carriers confirms it.
One analogue voice Card. (Equipment MEMOTEC CX. 960)
One multi I/O V24 Card. (Equipment MEMOTEC CX. 960)
One I/0 universal Card. (Equipment MEMOTEC CX. 960)

Jamaica
Two (2) MODEM Linkway with (1) Interface FR;
Two (2) L Band splitters/combinators and integration material: and
Two (2) SSPA de ***75*** W in the event the link budget for the transmission of two simultaneous carriers confirms it.
One analogue voice Card. (Equipment MEMOTEC CX. 960)
One I/0 universal Card (Equipment MEMOTEC CX. 960)

REDDIG Nodes

Brasil

Colombia
Four (4) digital voice modules in El DIM Card. (Equipment MEMOTEC CX950)

Ecuador
Two (2) digital voice modules in El DIM Card. (Equipment MEMOTEC CX950)

Peru

Venezuela
Four (4) Analogue Voice Cards. (Equipment MEMOTEC CX950)

OPTION C

REDDIG Nodes

Colombia
Two (2) MODEM Linkway with (1) Interface FR;
Two (2) L Band splitters/combinators and integration material: and
Two (2) SSPA de ***75*** W in the event the link budget for the transmission of two simultaneous carriers confirms it.
Four (4) digital voice modules in El DIM Card. (Equipment MEMOTEC CX950)

Venezuela

Two (2) MODEM Linkway with (1) Interface FR;
Two (2) L Band splitters/combinators and integration material: and
Two (2) SSPA de ***75*** W in the event the link budget for the transmission of two simultaneous carriers confirms it.
Four (4) Analogue voice Cards. (Equipment MEMOTEC CX950)

MEVA II Nodes

COCESNA
Two (2) MODEM Linkway with (1) Interface FR;
Two (2) L Band splitters/combinators and integration material: and
Two (2) SSPA de ***75*** W in the event the link budget for the transmission of two simultaneous carriers confirms it..
One analogue voice Card. (Equipment MEMOTEC CX. 960)
One I/0 universal Card. (Equipment MEMOTEC CX. 960)

Puerto Rico
Two (2) MODEM Linkway with (1) Interface FR;
Two (2) L Band splitters/combinators and integration material: and
Two (2) SSPA de ***75*** W in the event the link budget for the transmission of two simultaneous carriers confirms it.
One analogue voice Card. (Equipment MEMOTEC CX. 960)
One I/0 universal Card. (Equipment MEMOTEC CX. 960)

Note*: The Miami MEVA II node has not been included in this analysis, this will depend on the results of the future studies.*

APÉNDICE C

ANALISIS COSTO BENEFICIO OPCIONES A,B Y C

OPCION A

		1	2	3	4	5
COSTOS ADMINISTRATIVOS TO REDDIG NODES						
Admin MEVAII in REDDIG station Brasil	*1348*	*16,176*	*16,176*	*16,176*	*16,176*	*16,176*
Admin MEVAII in REDDIG station Colombia	*1348*	*16,176*	*16,176*	*16,176*	*16,176*	*16,176*
Admin MEVAII in REDDIG station Ecuador	*1348*	*16,176*	*16,176*	*16,176*	*16,176*	*16,176*
Admin MEVAII in REDDIG station Peru	*1348*	*16,176*	*16,176*	*16,176*	*16,176*	*16,176*
Admin MEVAII in REDDIG station Venezuela	*1348*	*16,176*	*16,176*	*16,176*	*16,176*	*16,176*
Use of segm satelital MEVA II Brasil	*245*	*2,940*	*2,940*	*2,940*	*2,940*	*2,940*
Use of segm satelital MEVA II Colombia	*1085*	*13,020*	*13,020*	*13,020*	*13,020*	*13,020*
Use of segm satelital MEVA II Ecuador	*105*	*1,260*	*1,260*	*1,260*	*1,260*	*1,260*
Use of segm satelital by MEVA II Peru	*245*	*2,940*	*2,940*	*2,940*	*2,940*	*2,940*
Use of segm satelital MEVA II Venezuela	*805*	*9,660*	*9,660*	*9,660*	*9,660*	*9,660*
TOTAL COSTOS		***110,700***	***110,700***	***110,700***	***110,700***	***110,700***
BENEFICIOS AHORRO COSTOS LINEAS DEDICADAS						
Colombia/Panama		*70,800*	*70,800*	*70,800*	*70,800*	*70,800*
Colombia/Jamaïca		*96,000*	*96,000*	*96,000*	*96,000*	*96,000*
Colombia/Curaçao		*48,000*	*48,000*	*48,000*	*48,000*	*48,000*
Venezuela/Aruba		*26,136*	*26,136*	*26,136*	*26,136*	*26,136*
Venezuela/Curaçao		*26,136*	*26,136*	*26,136*	*26,136*	*26,136*
Brasil/USA		*24,000*	*24,000*	*24,000*	*24,000*	*24,000*
Peru/USA		*88,000*	*88,000*	*88,000*	*88,000*	*88,000*
Equator/COCESNA		*60,000*	*60,000*	*60,000*	*60,000*	*60,000*
Colombia/COSESNA		*75,600*	*75,600*	*75,600*	*75,600*	*75,600*
Venezuela/San Juan		*43,968*	*43,968*	*43,968*	*43,968*	*43,968*
TOTAL BENEFICIOS		***558,640***	***558,640***	***558,640***	***558,640***	***558,640***
BENEFICIOS NETOS		***418,120***	***418,120***	***418,120***	***418,120***	***418,120***

INVERSION	
Equipment MEVA II in Brasil	
Modem+Splitter+SSPA	*71,825*
Memotec extra cards	*0*
Equipment MEVA II in Colombia	
Modem+Splitter+SSPA	*71,825*
Memotec extra cards	*2,200*
Equipment MEVA II in Ecuador	
Modem+Splitter+SSPA	*71,825*
Memotec extra cards	*1,100*
Equipment MEVA II in Peru	
Modem+Splitter+SSPA	*71,825*
Memotec extra cards	*0*
Equipment MEVA II in Venezuela	
Modem+Splitter+SSPA	*71,825*
Memotec extra cards	*4,950*
MEVA II Memotec extra cards (budgetary)	*6,000*
TOTAL INVERSION	***-373,375***
VAN	***1,012,370***

C-2

		1	2	3	4	5
COSTOS ADMINISTRATIVOS TO MEVA NODES						
Admin MEVAII in Curacao	*0*	*0*	*0*	*0*	*0*	*0*
Admin MEVAII in Panama	*0*	*0*	*0*	*0*	*0*	*0*
Admin MEVAII in COCESNA	*0*	*0*	*0*	*0*	*0*	*0*
Admin MEVAII in Aruba	*0*	*0*	*0*	*0*	*0*	*0*
Admin MEVAII in Jamaica	*0*	*0*	*0*	*0*	*0*	*0*
Admin MEVA II in USA						
Admin MEVA II in PR						
Use of segm satelital by MEVA II Curacao	*455*	*5,460*	*5,460*	*5,460*	*5,460*	*5,460*
Use of segm satelital by MEVA II Panama	*770*	*9,240*	*9,240*	*9,240*	*9,240*	*9,240*
Use of segm satelital by MEVA II COCESNA	*210*	*2,520*	*2,520*	*2,520*	*2,520*	*2,520*
Use of segm satelital by MEVA II Aruba	*105*	*1,260*	*1,260*	*1,260*	*1,260*	*1,260*
Use of segm satelital by MEVA II Jamaica	*105*	*1,260*	*1,260*	*1,260*	*1,260*	*1,260*
Use of segm satelital by MEVA II USA	*490*	*5,880*	*5,880*	*5,880*	*5,880*	*5,880*
Use of segm satelital by MEVA II PR	*350*	*4,200*	*4,200*	*4,200*	*4,200*	*4,200*
TOTAL COSTOS		***29,820***	***29,820***	***29,820***	***29,820***	***29,820***

ANALISIS COSTO BENEFICIO OPCIONES A,B Y C

OPCION B

C-3

	Monthly	1	2	3	4	5
COSTOS ADMINISTRATIVOS TO MEVA NODE						
Admin REDDIG in MEVA II station Aruba	$ 515	$ 6,181.8	$ 6,181.8	$ 6,181.8	$ 6,181.8	$ 6,181.8
Admin REDDIG in MEVA II station COCESNA	$ 515	$ 6,181.8	$ 6,181.8	$ 6,181.8	$ 6,181.8	$ 6,181.8
Admin REDDIG in MEVA II station Curazao	$ 515	$ 6,181.8	$ 6,181.8	$ 6,181.8	$ 6,181.8	$ 6,181.8
Admin REDDIG in MEVA II station Jamaica	$ 515	$ 6,181.8	$ 6,181.8	$ 6,181.8	$ 6,181.8	$ 6,181.8
Admin REDDIG in MEVA II station Panama	$ 515	$ 6,181.8	$ 6,181.8	$ 6,181.8	$ 6,181.8	$ 6,181.8
Admin REDDIG in MEVA II station Puerto Rico	$ 515	$ 6,181.8	$ 6,181.8	$ 6,181.8	$ 6,181.8	$ 6,181.8
Administrative support in Manaus						
Uso segmento satelital REDDIG station Aruba	$ 289	$ 3,469.0	$ 3,469.0	$ 3,469.0	$ 3,469.0	$ 3,469.0
Uso segmento satelital REDDIG stationCOCESNA	$ 1,156	$ 13,875.8	$ 13,875.8	$ 13,875.8	$ 13,875.8	$ 13,875.8
Uso segmento satelital REDDIG station Curacao	$ 578	$ 6,937.9	$ 6,937.9	$ 6,937.9	$ 6,937.9	$ 6,937.9
Uso segmento satelital REDDIG station Jamaica	$ 289	$ 3,469.0	$ 3,469.0	$ 3,469.0	$ 3,469.0	$ 3,469.0
Uso segmento satelital REDDIG station Panama	$ 1,542	$ 18,501.1	$ 18,501.1	$ 18,501.1	$ 18,501.1	$ 18,501.1
Uso segmento satelital REDDIG station Puerto Rico	$ 1,156	$ 13,875.8	$ 13,875.8	$ 13,876.0	$ 13,876.0	$ 13,876.0
TOTAL COSTOS		***97,220***	***97,220***	***97,220***	***97,220***	***97,220***
BENEFICIOS AHORRO COSTOS LINEAS DEDICADAS						
Colombia/Panama		*70,800*	*70,800*	*70,800*	*70,800*	*70,800*
Colombia/Jamaïca		*96,000*	*96,000*	*96,000*	*96,000*	*96,000*
Colombia/Curaçao		*48,000*	*48,000*	*48,000*	*48,000*	*48,000*
Venezuela/Aruba		*26,136*	*26,136*	*26,136*	*26,136*	*26,136*
Venezuela/Curaçao		*26,136*	*26,136*	*26,136*	*26,136*	*26,136*
Brasil/USA		*24,000*	*24,000*	*24,000*	*24,000*	*24,000*
Peru/USA		*88,000*	*88,000*	*88,000*	*88,000*	*88,000*
Equator/COCESNA		*60,000*	*60,000*	*60,000*	*60,000*	*60,000*
Colombia/COSESNA		*75,600*	*75,600*	*75,600*	*75,600*	*75,600*
Venezuela/San Juan		*43,968*	*43,968*	*43,968*	*43,968*	*43,968*
TOTAL BENEFICIOS		***558,640***	***558,640***	***558,640***	***558,640***	***558,640***
BENEFICIOS NETOS		***431,600***	***431,600***	***431,600***	***431,600***	***431,600***

INVERSION	
Equipment REDDIG in Aruba	
Modem+Splitter+SSPA	71,825
Memotec extra cards	2,035
Equipment REDDIG in COCESNA	
Modem+Splitter+SSPA	71,825
Memotec extra cards	2,035
Equipment REDDIG in Curazao	
Modem+Splitter+SSPA	71,825
Memotec extra cards	2,585
Equipment REDDIG in Jamaica	
Modem+Splitter+SSPA	71,825
Memotec extra cards	2,035
Equipment REDDIG in Panama	
Modem+Splitter+SSPA	71,825
Memotec extra cards	3,823
Equipment REDDIG in Puerto Rico	
Modem+Splitter+SSPA	71,825
Memotec extra cards	2,585
TOTAL INVERSION	**-446,048**
VAN	**990,871**

	Monthly		1	2	3	4	5
COSTOS ADMINISTRATIVOS TO MEVA NODES							
Admin MEVAII in Curacao	$	-	0	0	0	0	0
Admin MEVAII in Panama	$	-	0	0	0	0	0
Admin MEVAII in COCESNA	$	-	0	0	0	0	0
Admin MEVAII in Aruba	$	-	0	0	0	0	0
Admin MEVAII in Jamaica	$	-	0	0	0	0	0
Admin MEVA II in USA							
Admin MEVA II in PR							
Use of segm satelital by MEVA II Curacao	$	455	5,460	5,460	5,460	5,460	5,460
Use of segm satelital by MEVA II Panama	$	770	9,240	9,240	9,240	9,240	9,240
Use of segm satelital by MEVA II COCESNA	$	210	2,520	2,520	2,520	2,520	2,520
Use of segm satelital by MEVA II Aruba	$	105	1,260	1,260	1,260	1,260	1,260
Use of segm satelital by MEVA II Jamaica	$	105	1,260	1,260	1,260	1,260	1,260
Use of segm satelital by MEVA II USA	$	490	5,880	5,880	5,880	5,880	5,880
Use of segm satelital by MEVA II PR	$	350	4,200	4,200	4,200	4,200	4,200
TOTAL COSTOS			**29,820**	**29,820**	**29,820**	**29,820**	**29,820**

	22 Nodes	Monthly
$136,000	$ 6,182	$ 515

Does not consider cost of NCC/NMC personnel

ANALISIS COSTO BENEFICIO OPCIONES A,B Y C

OPCION C

	Monthly	1	2	3	4	5
COSTOS ADMINISTRATIVOS						
Administracion REDDIG						
MEVA II Station San Juan (cost to operate on REDDIG)	$ -	*0*	*7,556*	*7,556*	*7,556*	*7,556*
MEVA II Station COCESNA (cost to operate on REDDIG)	$ -	*0*	*7,556*	*7,556*	*7,556*	*7,556*
Soporte Administrativo en Manaos						
Administracion MEVA II AGS						
Estacion Colombia (cost to operate on MEVA II)	$ 1,380	*16,560*	*16,560*	*16,560*	*16,560*	*16,560*
Estacion Venezuela (cost to operate on MEVA II)	$ 1,380	*16,560*	*16,560*	*16,560*	*16,560*	*16,560*
COSTOS SEGMENTO SATELITAL						
Uso segmento satelital REDDIG San Juan	$ 1,349	*16,189*	*16,189*	*16,189*	*16,189*	*16,189*
Uso segmento satelital REDDIG COCESNA	$ 1,349	*16,189*	*16,189*	*16,189*	*16,189*	*16,189*
Uso segmento satelital MEVA Colombia	$ 1,085	*13,020*	*13,020*	*13,020*	*13,020*	*13,020*
Uso segmento satelital MEVA Venezuela	$ 805	*9,660*	*9,660*	*9,660*	*9,660*	*9,660*
TOTAL COSTOS		***88,178.00***	***103,289.12***	***103,289.12***	***103,289.12***	***103,289.12***
BENEFICIOS AHORRO COSTOS LINEAS DEDICADAS						
Brasil/USA		*24,000*	*24,000*	*24,000*	*24,000*	*24,000*
Peru/USA		*88,000*	*88,000*	*88,000*	*88,000*	*88,000*
Ecuador/COCESNA		*60,000*	*60,000*	*60,000*	*60,000*	*60,000*
Colombia/COCESNA		*75,600*	*75,600*	*75,600*	*75,600*	*75,600*
Venezuela/San Juan		*44,000*	*44,000*	*44,000*	*44,000*	*44,000*
Colombia/Panama		*70,800*	*70,800*	*70,800*	*70,800*	*70,800*
Colombia/Jamaïca		*96,000*	*96,000*	*96,000*	*96,000*	*96,000*
Colombia/Curaçao		*48,000*	*48,000*	*48,000*	*48,000*	*48,000*
Venezuela/Aruba		*26,136*	*26,136*	*26,136*	*26,136*	*26,136*
Venezuela/Curaçao		*26,136*	*26,136*	*26,136*	*26,136*	*26,136*
TOTAL BENEFICIOS		***558,672***	***558,672***	***558,672***	***558,672***	***558,672***
BENEFICIOS NETOS		***470,494***	***455,383***	***455,383***	***455,383***	***455,383***

INVERSION	
Equipos MEVA en Colombia	
Modem+Splitter+SSPA	*-71,825*
Memotec extra cards	*-2,200*
Equipos MEVA en Venezuela	
Modem+Splitter+SSPA	*-71,825*
Memotec extra cards	*-4,950*
Equipos REDDID en San Juan	
Modem+Splitter+SSPA	***-71,825***
Memotec extra cards	***-2,035***
Equipos REDDID en COCESNA	
Modem+Splitter+SSPA	***-71,825***
Memotec extra cards	***-2,585***
TOTAL INVERSION	***-299,070***

VAN	**1,210,692**

	18 Nodes	Monthly
	$136,000	*$ 7,556*	*$ 630*

Does not consider cost of NCC/NMC personnel

(Admin = Cost of network, NMC/NCC personnel)

What about Brazil, Peru and USA Conenctivity??