INTERNATIONAL CIVIL AVIATION ORGANIZATION

FIFTH MEVA II / REDDIG COORDINATION MEETING

(MR/5)

FINAL REPORT

Mexico City, Mexico
3 to 5 October 2007

Prepared by the Secretariat
October 2007

INTERNATIONAL CIVIL AVIATION ORGANIZATION

REPORT OF THE FIFTH MEVA II / REDDIG COORDINATION MEETING

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HISTORICAL

ii.1 Duration and Site of the Meeting

The Fifth MEVA II / REDDIG Coordination Meeting (MR/5) was held at the ICAO North American, Central American and Caribbean (NACC) Regional Office in Mexico City, Mexico, from 3 to 5 October 2007.

ii.2 Opening Ceremony

Mr. José Antonio Díaz de la Serna, Deputy Regional Director of the ICAO North American, Central American and Caribbean Office, gave the opening remarks for the Meeting and welcomed the participants; he emphasized the importance of the Meeting and its results and highlighted the need for close inter-regional cooperation in order to adopt actions to achieve the interconnection of the MEVA II and REDDIG VSAT networks. Also, he announced that two VSAT networks for aeronautical communications have been recently integrated in Africa, which is considered a global accomplishment and that he expects that we can soon announce the establishment of the MEVA II and REDDIG VSAT networks interconnection, which will provide many benefits to civil aviation and to States, Territories and International Organizations from the CAR/SAM Regions.

ii.3 Organization, Officers and Secretariat

Mrs. Dulce Roses from the United States was elected Chairperson and Mr. Gustavo Chiri from Argentina as Vice-Chairperson; Mr. Aldo Martínez, Regional Officer for Communications, Navigation and Surveillance from the ICAO NACC Regional Office, acted as Secretary with the assistance of Mr. Onofrio Smarrelli, Regional Officer for Communications, Navigation and Surveillance from the ICAO SAM Regional Office.

ii.4 Working Languages

The working languages of the Meeting were Spanish and English. The documentation and the Report of the Meeting were available to participants in both languages.

ii.5 Agenda

Agenda Item 1: **Review of the Responses to the Technical-Economical Request for Proposal (RFP) for the MEVA II/REDDIG Interconnection**

Agenda Item 2: **Review of the Approval Status of the Memorandum of Understanding (MoU) for the MEVA II/REDDIG Interconnection Solution**

Agenda Item 3: **Update on the Action Plan for MEVA II/REDDIG Interconnection Implementation**

Agenda Item 4: **Other Matters**

ii.6 **Schedule and Work Mode**

The Meeting agreed to hold its daily sessions from 09:00 to 15:00 hours, with two breaks. The Meeting also agreed to work in plenary.

ii.7 **Attendance**

The Meeting was attended by 24 participants from 11 States, Territories, and one International Organization Members of the MEVA II and REDDIG VSAT networks. The MEVA II Service Provider and the REDDIG Administrator also attended the Meeting. Likewise, the Meeting expressed its concern regarding the absence of some members of the networks, who are directly or indirectly involved in the interconnection process, especially Colombia. A list of participants is shown in pages iii-1 and iv-1 to iv-5.

ii.8 **Conclusions**

ii.9 **List of Working Papers, Presentations and Information Papers**

Working Papers

Number	Agenda Item	Title	Presented by
WP/01	--	Review of the Meeting Agenda and Schedule	Secretariat
WP/02	1	Follow-up to the RFP Process for MEVA II / REDDIG Interconnection	Secretariat
WP/03	1	Response from the MEVA II Service Provider Regarding the MEVA II / REDDIG RFP	Secretariat
WP/04	1	Reply from REDDIG Administration to the MEVA II / REDDIG RFP	REDDIG Administration
WP/05	3	Update Proposal of the Action Plan for the MEVA II / REDDIG Interconnection Implementation	Secretariat
WP/06	2	Follow-up on the Approval Process of the MEVA II / REDDIG MoU	Secretariat
WP/07	1	Summary Report of the Third Meeting of the MEVA II / REDDIG Task Force	Task Force

Presentations

Number	Agenda Item	Title	Presented by
--	1	Presentation on the MEVA II Service Provider Response to the RFP	MEVA II Service Provider

Information Papers

Number	Agenda Item	Title	Presented by
IP/01	--	List of Working and Information Papers	Secretariat

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Agenda Item 1: Review of the Responses to the Technical-Economic Request for Proposal (RFP) for the MEVA II/REDDIG Interconnection

1.1 Follow-up on the RFP Process for the MEVA II / REDDIG Interconnection

1.1.1 The Meeting took note that the MEVA II / REDDIG Interconnection Task Force completed the RFP document in accordance with the date established in Conclusion 4/2 – *Approval and response to the MEVA II / REDDIG RFP* and Conclusion 4/4 – *Adoption of the action plan for MEVA II / REDDIG interconnection*, which were formulated by the Fourth MEVA II / REDDIG Coordination Meeting (MR/4) held in Lima, Peru, from 7 to 9 March 2007.

1.1.2 The Meeting noted that the ICAO NACC and SAM Regional Offices, through letters LN 3/20.3.4-SA327 of 9 May 2007, and N1/3.6.3 EMX0487 of 17 May 2007, respectively, sent the RFP document to all MEVA II / REDDIG Administrations, for their review and approval. Copy of the RFP is shown in **Appendix 1A** to this part of the Report.

1.1.3 Of all the Member Administrations of the mentioned networks, comments to the RFP were received from Argentina, Brazil, Chile, Colombia, Cuba, Paraguay, Peru, Uruguay, United States, Venezuela and COCESNA. These States/International Organisation indicated in their reply to be in agreement with the RFP document. It was considered that MEVA II / REDDIG network members that had not replied were in agreement with the RFP document, as specified by the letters sent by the ICAO Lima and Mexico Regional Offices (LN 3/20.3.4-SA441 of 2 July 2007 and N1/3.6.3 EMX0593 of 19 June 2007, respectively).

1.1.4 In this regard, upon continuing with the activities presented in MR/4 Meeting Conclusions 4/2 and 4/4, the ICAO Regional Offices, on behalf of the MEVA II REDDIG Member Administrations, sent the RFP to the MEVA II Service Provider and REDDIG Administration, respectively, through letters N1/3.6.3–EMX0739 of 6 August 2007, and LT 12/1.2.1.2–SA564 of 8 August 2007.

1.1.5 The MEVA II Service Provider and the REDDIG Administration, upon analysing the RFP, formulated some questions concerning the interconnection. **Appendices 1B** and **1C** to this part of the Report include a copy of same, together with the replies from the MEVA II / REDDIG Interconnection Task Force in this regard.

1.1.6 The Meeting also took note that due to a time extension request on behalf of the MEVA II Service Provider, received on 14 September 2007, the response to the RFP for the MEVA II / REDDIG interconnection was expected to be received in the NACC Office on 26 September 2007. However, on 27 September 2007 the MEVA II Service Provider sent a message notifying that they were unable to send their response until 2 October 2007. Also, on 18 September 2007, the MEVA II Service Provider sent a question related to the MEMOTEC FRAD model used by REDDIG and the installed hardware and software. The response to the question is presented in **Appendix 1D** to this part of the Report. Furthermore, attached to the message requesting a deadline extension, the MEVA II Service Provider sent additional questions, which were responded to on 28 September, after the corresponding coordination with the REDDIG Administration. These responses are presented in **Appendix 1E** to this part of the Report.

1.1.7 The MEVA II Service Provider presented its response to the RFP in electronic format to the Third Meeting of the MEVA II / REDDIG Task Force, also held in the NACC Office, as well as to the MR/5 Meeting. Participants of both Meetings signed their commitment to comply with the Confidentiality Requirements regarding the response of the MEVA II Service Provider to the RFP.

1.1.8 Additionally, the REDDIG Administration provided its response to the RFP on the scheduled date, which was presented to the Meeting through WP/04.

1.2 Presentation and Analysis of the Responses Received from the MEVA II Service Provider and the REDDIG Administration

MEVA II Service Provider Response

1.2.1 The MEVA II Service Provider presented its response to the RFP in two volumes, which included the following aspects:

VOLUME I (Technical Proposal)

- Executive Summary
- Programme Management Approach
- Technical Solution
  - Technical Approach
  - Implementation Plan
  - Operation and maintenance activities
  - System performance

VOLUME 2 (Economic Proposal)

- Non-recurring summary
- Monthly security summary
- Total price options: purchase/leasing

1.2.2 After analysing the response of the MEVA II Service Provider to the RFP, the Meeting considered that the response presented, in detailed manner, all the required aspects to carry out the MEVA II / REDDIG interconnection. Likewise, the Meeting noted that this response not only contemplated the technical and economic aspects for the MEVA II / REDDIG interconnection in the Bogota and Caracas REDDIG nodes, but that it also included the MEVA II COCESNA node. The response included the implication of the rest of the MEVA II and REDDIG nodes indirectly involved in the interconnection.

1.2.3 Regarding the Technical and Economic Responses, and considering the recommendations of the Third Meeting of the Task Force and other aspects reviewed, the Meeting considered that the MEVA II Service Provider should review the aspects mentioned in **Appendix 1F** to this part of the Report.

1.2.4 Taking into account the aforementioned analysis, the Meeting urged the MEVA II Service Provider to review their response to the MEVA II / REDDIG RFP and, consequently, adopted the following Conclusion:

CONCLUSION MR/5/1 REVIEW OF THE RESPONSE FROM THE MEVA II SERVICE PROVIDER TO THE MEVA II / REDDIG RFP

That, the MEVA II Service Provider, considering the remarks on the technical and economic aspects of its response to the RFP described in Appendix 1F to this part of the Report, proceed to review said response in order to send the revision to the ICAO NACC Regional Office before **19 October 2007**.

REDDIG Administration Response

1.2.5 The Meeting took note that the REDDIG Administration presented its response to the MEVA II / REDDIG RFP by the deadline (14 September 2007), sent through letter LT 12/1.2.1.2, SA 564, by the ICAO SAM Regional Office, on 8 August 2007. The response is presented in **Appendix 1G** to this part of the Report.

1.2.6 The Meeting, when analysing the response from the REDDIG Administration, considered that it considered all aspects drafted in the MEVA II / REDDIG RFP. The response of the REDDIG Administration only presented the technical/economic proposal for the MEVA II / REDDIG interconnection in COCESNA.

1.2.7 The Meeting took note that the REDDIG Administration response to the RFP considered technical, economic and condition aspects of the proposal.

1.2.8 When reviewing the proposal, the Meeting considered the following aspects that the Administration had to carry out:

a) supply more information on the operation, management and handling of the REDDIG;

b) detail unit prices of equipment and services proposed in section 3.1.2 and 3.1.3 of the Economic Proposal;

c) include pricing for the implementation of new voice and data channels in the Economic Proposal. Detail unit prices of equipment and services proposed are included under Table 1 of Section II.

1.2.9 The REDDIG Administrator, in response to the Meeting remarks, provided a break-down of equipment prices for implementation in the COCESNA node as well as for the complementary services. All of this pricing is included in Appendix 1G to this part of the Report.

Considerations in the Event that the REDDIG Administration Acquires the Equipment on Its Own

1.2.10 While analysing the possibility of the acquisition of the necessary equipment by the REDDIG Administration for the interconnection of the Caracas, Venezuela and Bogota, Colombia nodes, the Meeting considered the responsibilities and coordination that the REDDIG Administration and the MEVA II Service Provider should take into account.

Responsibilities by the REDDIG Administration

a) Coordinate the preparation of the corresponding Implementation Plan for each node as well as the follow-up until completion with the MEVA II Service Provider.

b) Acquire all the necessary equipment defined and specified by the MEVA II Service Provider.

c) Send the two Linkway 2100 Modems with ground interface V.35 and Frame Relay protocol to the facilities of the MEVA II Service Provider in order for them to perform the pre-test. The transportation costs would be covered by the REDDIG Administration.

d) Pick-up the two Linkway 2100 Modems from the MEVA II Service Provider facilities when the aforementioned pre-test is completed and send them to the corresponding destinations. The transportation costs would be covered by the REDDIG Administration.

e) Send the additional equipment defined in a) above, from the factories or point-of-sale to the corresponding destinations. The transportation costs would be covered by the REDDIG Administration.

f) Introduce/release all the equipment in the corresponding destinations.

g) Complete the physical assembly of the equipment in each destination or node. This includes the mounting of cards, cables and equipment.

h) “Load” the bootfile files provided by the MEVA II Service Provider in all Linkway 2100 Modem equipment in the corresponding nodes.

i) Provide the MEVA II Service Provider with the current configuration files of the FRAD MEMOTEC equipment in the specified nodes.

j) “Load” the new configuration files provided by the MEVA II Service Provider in the FRAD MEMOTEC equipment in the corresponding nodes.

k) That all connections and interfaces needed for testing and activation of the new communication channels (voice and data) be ready for the interconnection purposes in the nodes.

l) Follow all the instructions provided by the MEVA II Service Provider for the channel testing and activation in the specified nodes for function in the MEVA II Network.

m) Maintain, repair or replace the equipment acquired on their own.

Responsibilities by the MEVA II Service Provider

a) Define and specify the equipment necessary for each node and deliver the corresponding list to the REDDIG Administration.

b) Coordinate the preparation of the corresponding Implementation Plan for each node with the REDDIG Administration, as well as the follow-up until its completion.

c) Carry out the pre-test in their facilities and provide the corresponding results to the REDDIG Administration.

d) Provide the bootfile files for all Linkway 2100 Modems for the specified nodes in order to function within MEVA II.

e) Configure and provide the new configuration files for all FRAD MEMOTEC equipment of the specified nodes in order to function within MEVA II.

f) Carry out testing providing the instructions to the REDDIG Administration, until channel activation at the specified nodes in order to function in the MEVA II network.

g) Report the performance of the mentioned nodes during the final phase and after the follow-up to the REDDIG Administration.

1.2.11 The Meeting noted that depending on COCESNA's decision regarding equipment acquisition, other responsibilities for the REDDIG Administrator and the MEVA II Service Provider could be agreed upon.

Satellite Contingency of the MEVA II and REDDIG Networks

1.2.12 Additionally, when the Meeting examined the MEVA II Service Provider proposal regarding the satellite contingency of the MEVA network, it recommended that a coordinated MEVA II and REDDIG satellite contingency plan should be established in order to guarantee that in the event of a satellite contingency, the provision of communication services continues to be provided through the interconnections. Therefore, it adopted the following conclusion:

CONCLUSION MR/5/2 ESTABLISHMENT OF A COORDINATED SATELLITE CONTINGENCY FOR THE MEVA II AND REDDIG VSAT NETWORKS

That, in order to guarantee that in the event of satellite contingencies, to maintain the availability of the communication services that will be provided through the interconnections of the MEVA II and REDDIG VSAT networks:

a) the MEVA II Service Provider and the REDDIG Administration review and coordinate the satellite contingency plan of their respective networks;

b) if as a result of the action described in a) above it is considered necessary, to coordinate the establishment of a joint satellite contingency plan for the MEVA II and REDDIG VSAT networks with INTELSAT to meet the aforementioned purpose; and

c) to inform Member Administrations of these Networks through the corresponding ICAO Regional Offices on the results of the review and coordination described in a) and b) above.

APPENDIX 1A

INTERNATIONAL CIVIL AVIATION ORGANIZATION

REQUEST FOR TECHNICAL AND COST PROPOSALS (RFP)

for

INTERCONNECTION OF THE MEVA II AND REDDIG SATELLITE TELECOMMUNICATIONS NETWORKS

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SECTION 1. GENERAL ADMINISTRATIVE PROVISIONS

SECTION 2. TELECOMMUNICATIONS SERVICE REQUIREMENTS

GENERAL ADMINISTRATIVE PROVISIONS
SECTION 1. General Administrative Provisions

This Section describes the general purpose and scope of International Civil Aviation Office (ICAO)'s MEVA II / REDDIG Interconnection programme and provides specific instructions to the MEVA II Service Provider and the REDDIG Administration regarding preparation and submission of technical and cost proposals for the telecommunications service requirements specified herein.

1.1 Statement of Purpose

The purpose of this RFP is to solicit a proposal for the interconnection of the MEVA II and REDDIG VSAT Telecommunication Networks.

The physical site locations of air traffic control facilities to be interconnected:

- Aruba
- Venezuela
- Colombia
- Brazil
- Peru
- Netherlands Antilles, Curacao
- USA, Puerto Rico, San Juan
- Guayaquil, Ecuador
- Jamaica, Kingston
- USA, Miami, FL
- Panama, Panama
- COCESNA, Honduras, Tegucigalpa

By issuing this RFP, the ICAO NACC and SAM Offices seek to interconnect specific MEVA II and REDDIG nodes and award a service contract that will expire on the 5-year anniversary date of the MEVA II contract.

1.2 Scope of Work

The scope of work for the MEVA II / REDDIG Interconnection project will consist of providing:

A complete and detailed Proposal for achieving the interconnection requirements according to their present equipment expertise i.e. MEVA II equipment with Americom Government Services (AGS) and REDDIG with the REDDIG Administrator, including equipment and services as well as any consideration/condition for its installation and operation. This proposal should be aimed finally in the ease of achieving the integration of both MEVA II and REDDIG Networks.

Both AGS and REDDIG Administration shall be responsible for doing the jobs without interruption to critical aeronautical communication services and providing the best technical and cost-efficient solution considering the existing equipment and the requested bandwidth potential growth.

Proposal from AGS and REDDIG Administration must include a complete and detailed description of the solution and its unitary cost for each item.

1.3 Historical Perspective

During the second MEVA II/REDDIG coordination meeting held in Lima, Peru from 20 to 22 March 2006, the meeting formulated the Conclusion 2/1 - *Implementation of communication interoperation requirement among the CAR, NAM an SAM region supported by VSAT networks.*

GENERAL ADMINISTRATIVE PROVISIONS
SECTION 1. General Administrative Provisions

The first meeting of the MEVA II/REDDIG Interconnection task force analyzed the subjects related with technical, operational control, and management for the Integration and Interconnection solutions. A cost benefit analysis was made for each of the solutions.

At the third MEVA II/REDDIG Coordination Meeting (Mexico City, 26-28 July 2006) it was considered that the technical operational solution to first adopt would be the MEVA II / REDDIG interconnection and, after the end of the MEVA II contract, the MEVA II/REDDIG integration would be implemented.

Second meeting of the MEVA II/REDDIG interconnection task force (Lima, Peru, 2-3 October) considered that the implementation of the MEVA II modem in Bogotá and Caracas, as well as the REDDIG modem in COCESNA, would permit MEVA II and REDDIG member to analyze the reliability of the networks during the transition phase, before implementation an integrated MEVA II/REDDIG network with only one management center.

Following the Conclusion 5/1 formulated during the Fifth Meeting of the CNS Committee (Lima, Peru, 13-17 November 2006), during the Fourth MEVA/REDDIG Coordination Meeting (Lima, Peru, 7-9 March 2007) it was agreed on the elaboration and preparation of a Request for Proposal (RFP) for the Interconnection works and its implementation (Decision 4/1).

1.4 The Present MEVA II and REDDIG Networks

1.4.1 REDDIG

System Description

1.4.1.1 Services

REDDIG Satellite network provides currently high quality Air Traffic Control voice and data services at sixteen sites in thirteen countries on the South America Region and one country from the Caribbean Region. The network uses VSAT (Very Small Aperture Terminal) technology using 3.7m C-Band antennas operating over the IS -1R satellite. The principal user services provided are voice and data. The network also supports a RC&M (Remote Control & Monitoring) service for efficient management of the network. The user voice services actually comprise three separate voice networks overlaid on the same bearers. These are the two Air Traffic Services - ATSd (hotline circuits) and ATSa (switched circuits) and the Administrative (switched) voice networks. Voice services are interfaced in an analogue fashion (E&M, FXS, FXO) or digital (E1 CAS & CCS) according to local requirements. The user data services comprise four networks also overlaid on the same satellite bearers. The initial service provided is 27 point-to-point asynchronous data links for the Aeronautical Fixed Telecommunication Network (AFTN). There are also point-to-point radar links implemented using various synchronous protocols. The Global Navigation Satellite Service (GNSS) network is implemented using the frame relay protocol on a high speed serial synchronous interface. The Aeronautical Telecommunication Network (ATN) is supported through a switched X.25 interface. The RC&M service comprises distributed elements (the local control and monitoring computer) and centralized elements, the Network Control Centre (NCC). Both the local and centralized elements may be accessed by remote control from any site. The RC&M network (which interconnects these elements) operates over-the-satellite and is a routed Bandwidth on Demand (BOD) IP network accessed through the Ethernet Hub at every site. To facilitate automatic Master Reference

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Terminal (MRT) redundancy there is also a direct bridged connection between the Ethernet Hubs at SAEZ and SBMN using a terrestrial link provided by the customer.

1.4.1.2 **Theory of Operation**

The user services connect to the REDDIG Network using dual redundant Frame Relay Access Devices (FRAD). The FRAD provides the diverse range of interface and protocol support required by the user's voice and data equipment. The FRAD provides voice and data switching functions allowing both permanent and switched circuit operation. All user services are multiplexed onto a single WAN interface using the Frame Relay Protocol. The MPS-FRAD prioritizes services so that they may co-exist on the same physical connection. Each FRAD defines a unique multiprotocol packet encapsulated (MPE) permanent virtual circuit (PVC) route for every possible destination. The majority of user services are interfaced through the Multiprotocol Packet Switching (MPS) FRAD – this FRAD also connects directly to the satellite terminal. On sites that utilize a digital voice interface this is the only type of FRAD required. Sites, like Piarco, that use an analogue voice interface are also equipped with a Multiplexer (MUX) FRAD that accommodates additional analogue voice cards. The MUX FRAD connects to the satellite terminal through the MPS FRAD using a 2Mbit/s link.

The bearer WAN network is provided by satellite terminal equipment, which implements the Multi-Frequency Time Division Multiple Access (MF-TDMA) protocol. Unlike conventional networks using continuous carriers, TDMA operates in burst-mode using a modulator that is agile in time, frequency and symbol rate. In the REDDING Network modulators may burst on any of three different carrier frequencies. The bottom two carrier frequencies accommodate 1.25Msym/s carriers and the top carrier frequency accommodates a further 0.625Msym/s carrier. As the Network Traffic expands it is possible to define further carriers, without any modification to the terminal hardware. The Master Reference Terminal (MRT) transmits a reference burst on the carrier 1 frequency which marks the beginning of the TDMA frame. All terminals in the Network receive this burst and thus are able to establish network timing. Further timeslots at the beginning of the burst frame are reserved for control bursts, signaling bursts and acquisition bursts and so these timeslots are not available to carry user traffic. When terminals transmit traffic bursts they use the frame structure defined by the reference burst to transmit in a previously agreed timeslot. The transmit burst timing is adjusted in a precision manner to ensure that bursts on a given frequency do not overlap as they pass through the satellite transponder. Each terminal has knowledge of its distance from the satellite and so is able to make the necessary timing correction.

It is important to understand however that each traffic terminal site only contains a single modulator and demodulator online at any time. What this means in practice is that whilst the modulator is bursting on say carrier 1 frequency in a particular timeslot, it cannot also be bursting at the same time on a different frequency. The same rule applies for a demodulator – it cannot receive on two frequencies simultaneously. The clever part of MF-TDMA is how the central controller (the NCC) manages the use of timeslots and carriers in response to demands for bandwidth on particular virtual circuits. It acts to make best possible use of the satellite bandwidth by grouping traffic amongst corresponding (ie communicating) terminals in different timeslots in the frame. When the traffic increases, the NCC starts to allocate burst timeslots from the second carrier. This process continues until all the timeslots on all the carriers are full at which point the network capacity limit has been reached. The process is also however subject to both receiving and transmitting blocking. When the network becomes very busy and high proportions of the available timeslots are used it can be the case that a new traffic demand cannot be satisfied. This is because all the available timeslots on the remaining carrier frequency are already being

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used by either one or both of the terminals on different carrier frequencies. The TDMA terminals support two types of Permanent Virtual Circuits (PVCs) – Frame Relay (FR) and Internet Protocol (IP). Frame Relay PVCs are used exclusively for user traffic bearers. IP PVCs are currently used only for the RC&M system. It is worth noting at this point that the RC&M network interfaces directly to the Ethernet port on the TDMA modem and so is independent in operation of the MPS or MUX FRADs.

1.4.1.3 Mode of Operation

The FR PVCs are configured as a full mesh – that is at every site there is defined two-way PVC which connects to each of the 14 other sites. The total number of FR PVCs to create a full mesh is simply 15 x 14 /2 = 105 FR PVCs. With the PIARCO node insertion in the REDDIG community 7 additional FR PVCs (up to 5 FR PVCs, as per contract, to standard REDDIG remote nodes, and 2 FR PVCs to NCC nodes) were added. The IP PVCs are configured as a dual-star network, with 14 IP PVCs radiating out from the two master sites (currently SAEZ and SBMN). The total number of IP PVCs are therefore 2x14-1=27 IP PVCs. Therefore, inserting the PIARCO node to the REDDIG community two additional IP PVC was created. The IP and FR PVCs are set up (at the NCC) by defining the two end point terminals and the Committed Information Rate (CIR or bandwidth) required for each connection. For CIR > 0 and without CIR reuse, the NCC immediately allocates timeslots for the traffic (one in each direction) and the relevant terminals start bursting for the appropriate period. For defined CIR without CIR reuse, bursting occurs whether or not there is any actual traffic. There is no further timeslot allocation process and traffic is not subject to contention. IP or FR packets are transmitted immediately – or at least as soon as the next timeslot occurs (ie within 27ms). The problem with this mode of operation is that satellite capacity (or burst timeslots) pre-allocated in this way is nailed-up and not available for new traffic demands even if the capacity is not being used at that time. Alternatively, the IP and FR PVCs may be defined with zero CIR, in which case the PVC is said to be operating in Bandwidth on Demand (BOD) mode. In this mode the timeslots are not allocated by the NCC until the terminal reports that the FR PVC has become active. Each terminal monitors the actual traffic demand on each of its PVCs and reports this information to the NCC via the signaling channel. When the PVC becomes active there is a short delay before bursts start and the PVC bandwidth becomes available. The system is subject to hysteresis; although bandwidth demands are acted on as quickly as possible, bandwidth is de-allocated in a gradual exponential decay. Generally services do not work well with bandwidth interruptions so the decay time is optimized so that bandwidth (or bursts) is not de-allocated during the active part of a data or voice circuit connection. The problem with this mode of operation is that the bandwidth is not instantly available – it can take 2 or 3 seconds for the active PVC to actually receive bandwidth. The final option for BOD is to select a global flag on the NCC which allows the bandwidth manager to reuse allocated CIR. With this option, for circuits that have defined bandwidth (CIR>0) the unused bandwidth is still returned to the bandwidth pool. Just like zero CIR circuits, the bandwidth is not instantly available when the demand comes along, however CIR>0 circuits still retain an advantage over those with zero CIR, because they have “first call” on the bandwidth in a contended situation. The important advantage of this mode of operation is that the maximum number of burst timeslots is kept free and the available satellite bandwidth pool is maximized. This in turn minimizes the probability of network blocking caused by a shortage of capacity. As initially configured all IP and the majority of FR PVCs are operated in a BOD mode (CIR=0). Some critical paths in the network (those carrying ATS and radar services) benefit from having defined CIR. The option to reuse unused CIR on all PVCs is enabled. The AFTN service in particular has been optimized to work efficiently, without any data loss using Zero CIR PVCs. This has been achieved by enabling an error control protocol (X.25) within the FRAD. The FRADs operating an AFTN/X.25 circuit negotiate end-to-end using Automatic Repeat Request (ARQ) to ensure delivery of the AFTN data.

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1.4.1.4 **Hardware**

The TDMA Networks comprises three element types – the Network Control Centre (NCC), the Master Reference Terminal (MRT) and the Traffic Terminal (TT). The NCC is a SUN workstation connected via an Ethernet connection to the MRT. MRTs and TTs are identical Linkway 2100 TDMA L-band modems configured for their respective roles. The Linkway 2100 has an L-band interface to connect to the Outdoor Unit (ODU). The TDMA network operates on the C-band US/Latin America beam of the IS -1R satellite at 45 degrees W longitude. The IS-1R satellite transponder used for REDDIG (3C/4C) uses linear vertical polarization, with the same polarization sense used for transmit and receive. The total lease currently allocated for the Network is 4.38MHz. In each case the link budget is designed to fully utilize the satellite EIRP associated with each carrier. Initially it was thought that the available VSAT EIRP (using a 40W SSPA) would only support operation at a maximum of 0.625Msym/s. So initially the system was configured with 5 identical 0.625Msym/s carriers. However, during system commissioning it was found that even at the edge of the beam (worst sites SOCA and SMPM) there is sufficient VSAT EIRP to operate 1.25Msym/s carriers. Higher data rates lead to greater TDMA frame efficiency so the final configuration is to operate the Carrier 1 and 2 at 1.25Msym/s with Carrier 3 operating at 0.625Msym/s. Burst capacity depends on the size of burst used. Burst size may be any multiple of 16Kbits/s according to the CIR defined or in the case of BOD operation according to the actual demand sensed by the terminal. However in practice the vast majority of bursts allocated in the network are 16Kbit/s capacity and the network has capacity for these as follows:

Carrier	Symbol Rate	16Kbit/s equiv
1	1.25Msym/s	32 bursts
2	1.25Msym/s	34 bursts
3	0.625Msym/s	17 bursts
TOTAL		83 bursts

Please note that a two-way circuit requires separate bursts to carry the data in each direction.

The VSAT terminals are equipped for 1:1 (1 for 1) chain redundancy. The MUX-FRAD (where fitted), MPS-FRAD, TDMA-Modem, Cross-Site Cable, Block Upconverter/SSPA and LNB are all duplicated. At the user interface the Baseband Switch routes the user traffic to the appropriate FRADs. At the antenna interface waveguide switches connect the antenna to the appropriate RF chain. The redundancy switches (waveguide and baseband) are electrically-ganged to select either the A chain equipment or the B-chain equipment. When auto-redundancy is disabled, it is straightforward to select either Chain A or Chain B operation locally or remotely. This allows maintenance or upgrades to hardware without any significant loss of service. Alternatively the redundancy system may be set into AUTO mode. In this mode the local computer monitors the state of the link management at the port of the online MPS-FRAD, which connects to the online TDMA modem. If link management goes into the “link-down” state then the auto redundancy system attempts to recover the site by switching once only to the opposite chain. The system is also equipped for backup over dial-up ISDN.

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1.4.2 MEVA II

The MEVA II VSAT Network was implemented by the MEVA Member States/Territories/International Organizations under the coordination of the ICAO North America Regional Office in Mexico. MEVA II, is a C Band voice/data network, vertical polarity, TDMA, Frame Relay, Full Mesh network with a single satellite hop via the IS-1R (formerly PAS-1R) satellite based on Viasat Linkway 2100 and Memotec Frame Relay Access Devices

The MEVA II system architecture employs Frame Relay over TDMA as the primary transmission means of achieving voice and data circuit connectivity among nodes throughout the entire network.

The system is capable of supporting a wide range of digital voice and data telecommunication services.

MEVA II has been implemented as a sub-network compatible with the aeronautical telecommunications network (ATN) to permit internetworking service in dissimilar network environments of the future ICAO CNS/ATM systems. In addition, the MEVA II network was designed to facilitate interconnection with other digital satellite and terrestrial telecommunications of other regional networks.

MEVA II is a full mesh-connected topology, with a single satellite hop via the IS-1R satellite, and provides connectivity between all nodes in the network using Frame Relay over TDMA.

Each MEVA II VSAT earth stations is equipped with Linkway 2100 TDMA terminal modem and a Memotec CX-960e Frame Relay multi-services access device.

The RF equipment consists of Terrasat RF outdoor equipments (40 Watt), LNBs (N-Type), AST5100 AGS Outdoor Box, TERRASAT IBUC 48 DC power Supply.

The CX-960e is equipped with a mix of user-side interface cards (circuit cards) that provide voice and data circuit terminations.

1.5 The Reason for Interconnection

The Interconnection requirements and specifications are part of a whole process of integration of networks, in which after a five year period from 2006, both MEVA II and REDDIG Network are to be integrated in a single network with a primary and a secondary operational centers.

The integration of the networks, and specifically this interconnection phase seeks to satisfy the different communications requirements between the CAR and SAM Regions and covering the future CNS/ATM requirements such as the ATN implementation, in a cost/Benefit - efficient manner.

The implementation of digital networks and their interconnection are agreed among states and ICAO (Recommendation 9/1 –RAN CAR/SAM/3, GREPECAS 10 Conclusion 10/27, GREPECAS 12 Conclusion 12/39,

Also considering Conclusion 5/16 ALLPIRG /5 discourage the proliferation of VSAT Networks and work towards regional/Interregional Digital Communication networks.

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1.6 **Points of Contact**

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1.7 **Required Proposal Format**

1.7.1 **Volume I - Technical Services Proposal**:

Section 1 -- Executive Summary: This section will contain a short summary of the bidder's technical proposal. The Executive Summary shall include a brief description of the proposed technical solution for the MEVA II / REDDIG interconnection solution and the bidder's program management approach (including project schedule), equipment provision, installation, testing and cutover (if is necessary) to operation.

Section 2 -- Technical Services: This section shall contain complete description of the bidder's proposed technical solution, method of approach, project implementation, and a description of all the telecommunications and management services being offered in response to the requirements sections of this RFP.

1.7.2 **Volume II - Cost Proposal**:

This volume shall contain the bidder's prices for all of the telecommunication equipment and services specified in this RFP. Volume II shall contain complete details of the bidder's prices for the outright purchase of equipment (with an option for Lease-to-Purchase) by the MEVA and REDDIG States, Territories and International Organizations. All prices shall be quoted in U.S. dollars.

The bidder may use its standard price quotation format for this purpose. Prices shall be provided for the five (5) base years and the five (5) one-year options. The bidder shall also include here all commercial terms and conditions of its offer (such as bid validity, method and terms of payment for equipment and services, etc.).

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This Section of the RFP, describes the required scope of telecommunication services for MEVA II / REDDIG Interconnection that are to be provided by AGS and REDDIG Administration. The requirements of this Section have been organized into sub-sections in the following manner:

2.1 Interconnection premises, Equipment Requirements and Performance Specifications
2.2 Telecommunications Circuits and Service Requirements
2.3 Contingency Communications Requirements
2.4 Equipment Maintenance and Spares Provisioning Requirements
2.5 System Testing, Service Cutover and Scheduling Requirements
2.6 Technical Documentation and System Software Requirements

2.1 Interconnection Premises, Equipment Requirements and Performance Specifications

2.1.1 Objectives for the MEVA II / REDDIG Network Interconnection

By issuing this RFP, MEVA II and REDDIG members have defined the requirement for a interconnection of circuits between designated MEVA II nodes and designated nodes in the REDDIG VSAT system using the IS – 1R satellite and compatible TDMA terminal equipment.

The interconnection technical solution shall be carried out under the premises that the REDDIG and MEVA II VSAT network operate under a full mesh network topology, using TDMA/Frame Relay satellite access, employing a IS-IR satellite transponder with a beam directed over United States /Latin America, C-Band operational frequencies and co-linear vertical polarization.

This objective is foreseeing the implementation of MEVA II compatible modems in the REDDIG Nodes in Bogotá, Colombia and Caracas, Venezuela, and a REDDIG compatible Modem in the MEVA II node in COCESNA.

For all new equipment offered by the bidder to meet the service requirements of this RFP, the Service Provider shall use only commercial-off-the-shelf (COTS) equipment and/or software from reputable manufacturers and suppliers.

The bidder's proposed design for the MEVA II / REDDIG Interconnection solution must be modular and technologically upgradeable, state of the art, compatible with existing modules in the existing VSAT nodes, thereby permitting a high degree of flexibility for implementing future changes in communications services when requested to do so by ICAO.

The bidder must place particular emphasis on the availability and reliability performance factors.

2.1.2 Key Requirements of the MEVA II / REDDIG Interconnection Service Solution

Taking the above requirements into full consideration, the bidder's proposal must address in sufficient detail how the Service Provider will meet the following key requirements:

- Implement a MEVA II / REDDIG Interconnection solution that is capable of using a wide variety of standard information protocols such as X.25, IP, ATM, Frame Relay, and circuit switching protocols for future ATN support.

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- The bidder must provide each MEVA II / REDDIG end-user with a written monthly report showing the end-user's individual bandwidth usage, call record details, system performance statistics, and a trouble log summary (e.g., trouble ticket number, transaction date/time, trouble reported, cause and repair, and technician name at both ends), as well as the same service being now provide in the MEVA II Network or in the same level as is being provided in the REDDIG Network.

Link Budget

- The bidder's proposal shall include a Satellite Link Budget Performance Analysis for each MEVA II or REDDIG site in the system, basing it on the proposed equipment solution and the minimum bandwidth requirements needed for the MEVA II / REDDIG Interconnection circuit and connectivity requirements identified in this RFP.

2.1.2.1 Indoor Unit (IDU) Requirements

The communications terminal and end-user equipment being offered must be compatible with the current equipment used in the MEVA II and REDDIG Networks.

The bidder's proposal shall demonstrate maximum use of the existing RF Terminal (IDU) equipment at MEVA II and REDDIG sites in their proposed service solution. Where this is not entirely practical the bidder shall propose and justify an alternative solution. No major addition to the present architecture is foreseen since the MEVA II and REDDIG nodes are technically similar.

An additional Linkway2100 (IDU) is needed to support simultaneous communications with two independent networks so the bidders should offer additional MODEM Linkway 2100 at VSAT nodes involved (Caracas, Bogotá and COCESNA)

2.1.2.2 Outdoor Unit (ODU) Requirements

The bidder's proposal shall demonstrate maximum use of the existing RF Terminal (ODU) equipment at MEVA II and REDDIG sites in their proposed service solution.

Because of the same VSAT node architecture is used for the MEVA II and REDDIG nodes, no ODU equipment should be duplicated to satisfy these requirements.

2.1.2.3 MEVA II / REDDIG Antenna System

The Service Provider must use the existing MEVA II / REDDIG antenna systems (dish antenna, feed assembly, LNB, etc.) and co-linear vertical polarization in its proposed service solution for MEVA II / REDDIG Interconnection.

2.1.2.4 Network Control Center (NCC)

REDDIG NCC

The REDDIG NCC shall continue to provide the overall monitoring and control (M & C) functions at all its respective VSAT nodes. Also it shall continue to provide overall network TDMA burst timing and synchronization for their respective VSAT nodes.

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MEVA II NCC

The MEVA II NCC shall continue to provide the overall monitoring and control (M & C) functions for all its respective VSAT nodes. Also it shall continue to provide overall network TDMA burst timing and synchronization for its VSAT nodes.

Considerations of MEVA II and REDDIG NCC/NMS:

The Service Provider's NCC shall perform overall monitoring and control (M&C) functions required for the MEVA II / REDDIG Interconnection. Network and remote VSAT terminal equipment configurations shall be defined at the NCC and automatically distributed to each of the MEVA II or REDDIG terminal in the network via satellite link.

The NCCs shall provide overall network TDMA burst timing and synchronization for their respective MEVA II or REDDIG sites. This functionality, referred to generically to in this RFP as the Master Reference Terminal (MRT), shall be provided from the Service Provider's NCC or from other locations that are directly under the Service Provider's control.

A backup or redundant NCC/ Secondary Reference Terminal (SRT) shall be maintained by the Service Provider at a geographically distant location from the primary MRT in order to eliminate the loss of network timing and synchronization in the event of a system outage at the primary NCC or a sun outage at the primary MRT site.

For maintenance coordination purposes, a shout-down or voice order wire circuit shall be provided between each VSAT remote site and the NCC that permits end-user personnel to communicate with NCC operations staff. The Service Provider shall also provide a PSTN telephone number that can be called by any end-user to reach NCC personnel. An alternative PSTN telephone number to a higher level authority in the Service Provider's organization shall be provided that will allow any MEVA II user to call for assistance in the event that the NCC does not answer a call to the primary number after (3) three rings.

The Service Provider's NCC shall be manned with English and Spanish speaking operations staff, 24 hours a day, 7 days a week, 365 days of the year.

The primary function of the Service Provider's NCC staff is to monitor the operational status and performance of the MEVA II/REDDIG networks and to assist MEVA II /REDDIG end-user personnel in the process of trouble diagnosis and restoring service to satisfactory operational status.

Administrative coordination to be included in proposal by bidders:

The procedures to be implemented when there is any problem in a REDDIG node, communicating with MEVA II, shall be the following:

- MEVA II service provider shall call the REDDIG Administrator informing of the happening.
- The REDDIG Administrator shall call the respective node and shall establish an audio conference between MEVA II service provider and Caracas or Bogotá local technicians, as necessary.

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- REDDIG NCC, under control of the Administrator, shall supervise communications between MEVA II service provider and REDDIG nodes technicians.

- The MEVA II service provider is the only one that may call the REDDIG Administrator to open or close the respective trouble ticket.

The procedures to be implemented when there is any problem in a MEVA II node, either in the MODEM or other equipment permitting the interconnection with REDDIG, will be the following :

.A The REDDIG Administrator shall call the MEVA II service provider informing of the happening.

.B The MEVA II service provider shall call the respective node and shall establish an audio conference between REDDIG Administrator and local technicians as necessary ;

.C The MEVA II NCC, under control of the Service Provider shall supervise communications between REDDIG Administrator and MEVA II nodes technicians.

.D The REDDIG Administrator is the only one that may call the MEVA II Service Provider Administrator to open or close the respective trouble ticket.

The MEVA II and REDDIG primary and alternate NCC shall be physically secure facilities with controlled access that is strictly limited to NCC operations staff.

The Service Provider's NCC shall be operated from highly reliable commercial AC power that is backed up by an on-site diesel-generator and battery backup power source that automatically starts in the event of a commercial power failure.

2.1.2.5 **Desired Space Segment Architecture**

The INTELSAT IS-1R satellite shall be used by the MEVA II Service Provider and the REDDIG Administration to provide telecommunications services for the MEVA II / REDDIG Interconnection.

The US-LATIN BEAM, C-BAND, and Co-pol vertical polarization shall be used for all interconnection services.

2.1.2.6 **Remote VSAT Site and Terminal Addressing**

Addressing and control of the VSAT terminal must be provided by the respective network control system. In addition to addressing and controlling the interconnected VSAT terminals the systems shall be capable of simultaneously addressing their respective VSAT terminals, in the MEVA II or REDDIG networks.

The NCC/NMS shall have control over assignment of their respective Master Reference Terminal (MRT) and Secondary Reference Terminal (SRT) functions.

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2.1.2.7 **Acquisition and Synchronization**

The TDMA system shall compensate for timing variations and loss of network burst synchronization due to Doppler frequency shift of the RF carrier that is caused by satellite motion.

The TDMA NCC/NMS control system shall recognize and acquire any new remote MEVA II /REDDIG Interconnection VSAT terminal entering the network within a maximum of 30 seconds of VSAT terminal power-up.

The TDMA NCC/NMS control system shall recognize and report any MEVA II /REDDIG Interconnection VSAT terminal equipment or link performance alarm or a loss of service condition within 30 seconds of such an incident.

2.1.2.8 **Clock Management**

In order to minimize possible system and network timing errors each MEVA II/REDDIG Interconnection remote VSAT terminal shall automatically monitor and adjust its internal digital synthesizer timing to match that of the respective MRT and SRT. In order to minimize such timing errors, an industry-standard highly accurate external clock source shall be used at the MRT and SRT.

2.1.2.9 **Network Management Requirements**

Each Service Provider's NCC shall provide and maintain central control over their respective networks as well as the equipment and services provided for the interconnection. The interconnection objective of this RFP must fully comply with the present functions of the correspondent NCC/NMS, which are detailed in **Appendix A** of this document. [Appendix A is a list of requirements; as such these requirements should be integrated in the main body of the RFP and not as an Appendix.]

2.2 **Telecommunications SERVICES and PRICING Requirements**

2.2.1 **Telecommunications Equipment Requirements**

Appendix B of this RFP contains a current list of MEVA II / REDDIG Interconnection circuit requirements that are to be satisfied in the proposals. Bidder's prices for any additional items such as port charges, space segment charges, maintenance; other required services, etc., shall be fully identified and included in proposal Volume II.

Appendix C presents an estimated equipments list needed for the interconnection, and is given as a reference the bidder shall use this information as reference for its proposal.

2.2.2 **Non-Recurring Charges for Telecommunications Services**

Any additional non-recurring charges proposed shall be identified and fully explained in proposal Volume II of the RFP.

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2.2.3 **Monthly Recurring Charges for Telecommunications Services**

Recurring charges for operating and usage of all circuits specified in 2.2.1 shall be detailed in Volume II of the proposal; including any conditions or consideration not indicated in this document.

2.3 **Equipment Maintenance and Spares Provisioning Requirements**

2.3.1 **New Equipment**

The Service Provider shall provide, maintain, repair and replace any new equipment required for the proposed MEVA II /REDDIG Interconnection service solution.

In proposal Volume II, the bidder shall identify and quote the cost to MEVA II /REDDIG end-users for any new and/or on-site equipment spares at a level necessary to maintain the system at the reliability and availability figures and Quality of Service (QoS) levels specified for MEVA II in this RFP as well as the credits in case of lacking the performance required:

Quality of Service (QoS) Performance Parameters

Parameter	Specification
1. Minimum acceptable performance of a half-duplex (one-way) satellite RF link on the basis of BER performance:	a) Not less than 99.9% for a VSAT terminal link over the latest (rolling) 12-month period with a BER of $>1x10^{-6}$ as measured over the latest (rolling) 24-hour period. b). A VSAT RF link BER worse than $1x10^{-4}$ for a period exceeding 10 continuous minutes. c). Intermittent VSAT RF link outages (periodic dropouts or RF carrier chopping) exceeding six (6) dropouts per continuous minute.
2. Maximum Service Restoration Time due to any cause (excluding AGS response time and reasonable travel time to the affected site):	24 hours
3. Maximum Routine Preventive Maintenance Service Interruption Time:	8 hours per year
4. Minimum Interval between Service Interrupting Routine Preventive Maintenance:	2190 hours
5. Maximum Number of Service Outages per latest (rolling) 12 month period due to any cause(s):	6

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Credit Computation

Performance Requirements	Criterion for Assessing a Penalty	Credits Assessed for Each Incident based on Monthly Recurring Charges
1. Minimum Availability of a Satellite RF Link	A) Availability is less than specified	A: 100%
2. Maximum Service Restoration Time	A) Exceeds required restoration time by 10% B) Exceeds required restoration time by 100% C) Exceeds required restoration time by 300%	A: 10% B: 50% C: 100%
3. Maximum Preventive Maintenance Service Interruption Time	A) Exceeds the maximum allowed time by 10% on a rolling 12-month basis B) Exceeds the maximum allowed time by 10% on a rolling 12-mont basis for 12 or more consecutive months.	A: 50% B: 100%
4. Maximum Interval Between Service Interrupting Preventive Maintenance	A) Service interrupting preventive maintenance is performed after an interval that is less than the minimum interval by one hour or more. B) Service interrupting preventive maintenance per A) above is performed three or more consecutive times.	A: 50% B: 100%
5. Maximum Number of Outages (per latest 12 month period)	A) Exceeds the maximum number on a rolling 12-month basis. B) Exceeds the maximum number on a rolling 12-month basis for three consecutive months. C) Exceeds the maximum number on a rolling 12-month basis for four or more consecutive months.	A: 25% B: 50% C: 100%

The bidder shall state the warranty terms and conditions for any new purchased or leased equipment required for the proposed interconnection service solution.

MEVA II / REDDIG INTERCONNECTION TELECOMMUNICATIONS SERVICE REQUIREMENTS
SECTION 2. TELECOMMUNICATIONS SERVICE REQUIREMENTS

2.3.2 Plan for Maintenance, Repair and Replacement of Existing Equipment

The bidder shall propose a practical plan (with terms and conditions) to maintain, repair and replace any of the interconnection equipment for the time of the service contract. The prices associated with these efforts shall be identified in Proposal Volume II.

2.3.3 Plan for Routine Equipment Maintenance and Emergency Repairs

The additional equipment that would be installed in the REDDIG nodes and that would route communications requirements with MEVA II nodes, shall be maintained by the respective REDDIG member States, under the coordination of the REDDIG Administrator.

The additional equipment that would be installed in the MEVA II node, with communications requirements with REDDIG nodes, shall be maintained by COCESNA, in coordination with the MEVA II Service Provider.

2.4 System Testing, Service Cutover and Scheduling Requirements

The bidder shall propose a plan for testing the installed and integrated interconnection equipment prior to Service Acceptance Certification. The MEVA II service provider and the REDDIG Administrator shall be responsible for coordinating and managing the integration of all telecommunications circuits for the interconnection. This shall be accomplished with no interruption to critical aeronautical communications services on the MEVA II and REDDIG networks. The bidder's proposed transition plan shall take into consideration the need for:

- Equipment Installation Testing
- Operational Readiness Testing
- Thirty Day System Performance Evaluation
- Service Acceptance Certification

The bidder shall include this plan in Volume 1, of its proposal. The costs for these efforts shall be identified in Volume II.

2.5 Technical Documentation and System Software Requirements

2.5.1 Technical Documentation

The bidder shall include, in proposal Volume II, a set of the manufacturer's technical documentation describing any new equipment that will be provided and installed under the interconnection contract.

Within 60 days after completion, testing and commissioning of a new interconnection circuits the Service Provider shall provide each end-user involved with two sets of site as-built engineering records to the end-user.. The records shall include a system block and level diagram, cable and circuit connection lists, and all other details reflecting each installed site configuration. In addition, the Service Provider shall provide each interconnection end-user with two sets of the manufacturer's theory of operation and service manual for each item of new equipment supplied by the Service Provider.

MEVA II / REDDIG INTERCONNECTION TELECOMMUNICATIONS SERVICE REQUIREMENTS
SECTION 2. TELECOMMUNICATIONS SERVICE REQUIREMENTS

2.5.2 System Software

The bidder's proposal Volume I shall include documentation describing the operating systems software and firmware used interconnection. The documentation shall identify commercial off-the-shelf software and firmware and any proprietary software and firmware developed or to be developed by the bidder that will be used in the MEVA II/REDDIG interconnection services.

The Service Provider shall maintain the currency of all such software and firmware and notify the ICAO NACC and SAM Offices, and each MEVAII /REDDIG end-user in advance whenever software and firmware upgrades or changes are going to be implemented throughout the MEVAII /REDDIG interconnection services.

Within 60 days after completion, testing and commissioning of a site installation the Service Provider shall provide every end-user with a copy of the site license for any commercial software used in the system.

2.6 Service Provider Initiated Network Changes

2.6.1 Change Notifications

The Service Provider shall notify the ICAO points of contact in writing at least 60 days in advance of all significant planned changes to the configuration of the MEVA II/REDDIG interconnection services; changes in equipment or software that affect MEVAII/REDDIG interconnection functionality or performance, or changes in space segment configuration.

Such changes shall be accompanied by sufficiently detailed engineering documentation and explanation. The ICAO points of contact shall receive change notices from the Service Provider at least 30 days prior to the start of work on such changes.

The Service Provider shall obtain the approval of the ICAO points of contact at least 30 days prior to performing any planned changes that would adversely affect MEVAII/REDDIG interconnection services, including any periods of service outage for equipment maintenance or equipment/software changes.

2.7 Activation of New Services

Any MEVA II or REDDIG State, Territory or International Organization may request the Service Provider to provide new or additional equipment and/or Aeronautical telecommunications services during the lifetime of the MEVA II/REDDIG interconnection contract.

2.8 Discontinuation of Service

Upon completion or termination for any reason of a lease for MEVA II/REDDIG interconnection service or upon termination of a MEVA II/REDDIG interconnection Service Agreement between any Member State/Territory//International Organization and the Service Provider, the Service Provider shall be responsible for:

Removing any Service Provider owned equipment and material from the designated site.

MEVA II / REDDIG INTERCONNECTION TELECOMMUNICATIONS SERVICE REQUIREMENTS
SECTION 2. TELECOMMUNICATIONS SERVICE REQUIREMENTS

2.9 MEVAII/REDDIG Program Administration

The MEVA II Service Provider and REDDIG Administrator shall work with the MEVA II TMG, REDDIG Coordination Group, the MEVA II and REDDIG Member States/Territories/ International Organizations to support program management and administrative activities. This shall include attendance at meetings or participation in teleconferences scheduled by ICAO, REDDIG Coordination or the MEVA II TMG. Participation at such meeting and in teleconferences shall be at the expense of each Civil Aeronautical Administration.

APPENDIX A: NMC/NMS FUNCTIONS

NMC/NMS FUNCTIONS

- Network Configuration Management
- RF Carrier Acquisition, Synchronization and Control
- RF Carrier Burst Timing
- Bandwidth On Demand (BOD) Management
- SVC and PVC circuit set-up and take-down
- Fault Protection and Equipment Alarm Reporting
- Overall Network and VSAT Link Level Performance Monitoring
- MEVA II Network Security Management
- Communications Circuit Security Management
- Accounting and Billing Records Management
- Equipment Spares Inventory Management
- System Software/Firmware Updates Management

Network Configuration Management

The correspondent NCC/NMS system shall store all equipment configuration data for the MEVA/REDDIG Interconnection including configuration data for the NMS and all remote VSAT terminals in the MEVA II/ REDDIG interconnection. Configuration data file used for this purpose shall be based on a standard format as used in a database management system.

The NCC/NMS system operator shall have the capability to change (add, delete or modify) configuration data as necessary to maintain network configuration and control.

At NMS startup and upon any configuration changes, the NCC/NMS system shall download the changes configuration data via satellite links to all remote interconnection VSAT equipments.

RF Carrier Acquisition, Synchronization and Control

The MEVA II and REDDIG NCC/NMS shall control RF carrier acquisition and synchronization of their respective VSAT terminals involved in the MEVAII REDDIG interconnection. Upon system startup, the NCCs shall establish contact with the MRT (and SRT) and command it to initiate reference station acquisition and burst timing synchronization and keep these stations in precise adjustment with satellite movement in orbit.

Bandwidth Management

The NCC of MEVA II and REDDIG shall maintain central bandwidth management functions for efficient operation of the MEVA II/REDDIG interconnection. The bandwidth management functions shall accomplish dynamic bandwidth allocations (i.e., bandwidth-on-demand) and fixed bandwidth allocations for the various types of circuits derivate from the MEVA II/REDDIG interconnection and access protocols being supported by the system.

APPENDIX A: NMC/NMS FUNCTIONS

Network and Satellite Link Level Performance Monitoring

The Service Provider shall maintain a performance and alarm management system (an NMS function) that maintains continuous monitoring over the health and performance of the respective interconnection VSAT equipments in the MEVA II/REDDIG Network.

The NMS shall provide a view of transmit and receive burst data and collect performance data (e.g., BER, link performance, Frame Relay and IP traffic statistics) from the respective interconnection VSAT terminals in the MEVA II/REDDIG Network.

The NMS shall be able to collect major and minor fault alarms and Frame Relay and IP traffic statistics from the respective remote interconnection VSAT terminals in the MEVA II/REDDIG Network, as well as perform automatic diagnostic. The NMS shall make this data available to NCC personnel who will use it to diagnose troubles associated with link performance and equipment operation at sites.

In his proposal, the bidder shall provide a list of the alarms and functions monitored by the NMS.

Network Security Management

In order to provide network security management for the MEVA II/REDDIG interconnection the following consideration shall be considered for the REDDIG and MEVA II networks:

The minimum security arrangements required by REDDIG, and that should be followed by the MEVA II, are:

- MEVA II network have no direct communications with public networks.
- The equipment is not shared with services different to MEVA II.
- Access restriction to equipment belonging to the network, through the use of a password.
- The network must exclusively support services to which it was originally constituted for.

The minimum security arrangements required by MEVA II, and that shall be followed by REDDIG, are:

- REDDIG network have no direct communications with public networks.
- The equipment is not shared with services different to REDDIG.
- Access restriction to equipment belonging to the network, through the use of a password.
- The network must exclusively support services to which it was originally constituted for.

Network Protocols and Services

The interconnection equipments shall be capable of using industry standard Frame Relay, X.25, circuit switching protocols, ATM, and IP transmission protocols in order to achieve the most cost efficient use of satellite bandwidth and equipment resources.

APPENDIX A: NMC/NMS FUNCTIONS

Internet Protocol (IP) Service

The TDMA/Frame Relay terminal shall be capable of providing, on-demand, the following standard IP routing protocols:

- Routing Information Protocol, both RIP-1 and RIP-2
- Open Shortest Path First (OSPF) Protocol for future packet applications
- Border Gateway Protocol (BGP-4) for special applications
- Internet Group Management Protocol (IGMP for possible future multicast applications)

Frame Relay (FR) Service

The TDMA terminal shall be capable of supporting UNI/NNI connection level with ANSI or ITU local management interface (LMI) access management and it shall be compliant with current ITU and ANSI standards.

Frame Relay service setup and provisioning shall be accomplished under control of the Service Provider's NMS at the primary and backup NCCs.

Frame Relay service provisioning shall allow selection of the transmission rate, clock source, the type of interfaces (RS-449, V.35, EIA 530, etc.), and determine the local management interface (LMI or ITU) and other related parameters.

Frame Relay service provisioning shall allow both source and destination sites, their respective circuit interfaces and related QoS parameters (e.g., CIR and Bc) to be established on command and monitored by the NMS.

In the event a VSAT RF link or a VSAT terminal goes down for any reason, the link connection shall be reported by the NMS as inactive, and the assigned bandwidth shall be temporarily de-allocated for shared use within the network. When the VSAT link or terminal recovers, the connection shall be automatically re-established and bandwidth re-allocated.

Satellite Link Availability

All MEVAII and REDDIG VSAT satellite RF links shall provide a minimum of 99.9 percent availability performance as measured from satellite modem to satellite modem using the BER (or the equivalent E_b/N_o or Symbol Rate) method of calculation.

The VSAT RF satellite links shall provide an average Bit Error Rate (BER) of $1x10^{-6}$ BER or better as measured over the latest (rolling) 24-hour period during the worst rain period out of the year for the affected VSAT node. The bidder shall state his guaranteed Committed Information Rate (CIR) for services provided under this specification.

Whenever the satellite RF link's BER becomes worse than $1x10^{-4}$ for a period exceeding 10 continuous minutes the Satellite Provider's NMS shall declare the link to be out of service.

APPENDIX A: NMC/NMS FUNCTIONS

Intermittent outages (periodic RF carrier dropouts or RF carrier chopping as detected in the earth station's satellite modem) exceeding six (6) dropouts per continuous minute (60 seconds) shall also be declared a loss of service by the NMS.

Service outages due to blocking of the satellite signal by the sun (i.e., sun-transit outages) that occurs during the spring and fall equinox shall not be counted towards link availability performance.

The MEVA II Service Provider and the REDDIG Administrator shall notify the end-user concerned fourteen (14) days in advance of schedule maintenance outages.

Back-up transponder and satellite for contingency planning. The bidders shall provide detailed procedures so change over can be performed by trained technicians in the field.

Switched Voice Circuit Call Blocking Performance

Switched voice circuits shall have an Erlang B call blocking probability of no greater than 0.05 (five percent) at all times and under all traffic loading conditions. Voice Circuit Latency Performance

The total one-way latency for PAMA and Switched Voice Circuits between service delivery points shall not exceed 400 milliseconds (demarcation point to demarcation point) under all possible satellite link conditions and earth station equipment configurations. Latencies for the voice circuits specified in this RFP shall be shown in the bidder's link budget calculations.

Data Circuit Latency Performance

Total one-way latency for dedicated Data and Packet Switched Circuits between service delivery points (local circuit demarcation frames) shall not exceed 350 milliseconds (demarcation point to demarcation point) under all possible satellite link conditions and earth station equipment configurations. Latencies for data circuits specified in this RFP shall be shown in the bidder's link budget calculations.

APPENDIX B: CIRCUIT REQUIREMENTS

CIRCUIT REQUIREMENTS

COMMUNICATIONS SERVICES REQUIREMENTS FOR MEVA II / REDDIG INTERCONNECTION

Table 1 – CAR/SAM AFS interconnection requirements in the Caracas, Venezuela, REDDIG node

No.	CAR/SAM	Required AFS Circuits	Remarks
1	2	3	4
1	Curaçao / Caracas	1 ATS voice– A 1 AFTN data, 2400 bps, X25, IA-5	
2	Aruba / Venezuela	1 ATS voice – A	
3	Puerto Rico / Venezuela	1 ATS voice – A 1 AFTN data, 2400 bps, X25, IA-5	

A: Indicates ATS requirements for voice communications which should be established in 15 seconds.

Table 2 - CAR/SAM AFS interconnection requirements in the Bogota, Colombia, REDDIG node

No.	CAR/SAM Interconnections	Required AFS Circuits	Remarks
1	2	3	4
1	Colombia (Barranquilla)/Curaçao*	1 ATS voice – A	
2	Colombia (Barranquilla)/Jamaica*	1 ATS voice – A	
3	Colombia (Bogota)/Panama Barranquilla / Panama* Bogota / Panama* Cali / Panama* Medellin / Panama* San Andres / Panama*	1 AFTN data, 2400 bps, X25, IA-5 1 ATS voice – A 1 ATS voice – A 1 ATS voice – A 1 ATS voice – A 1 ATS voice – D	Panama has two terminals of the Harris 2020 ATS speech circuit switching centre installed in Bogota. Therefore, interconnection requirements would be reduced to two ATS* and one AFTN channels.
4	Colombia (Bogota)/ CENAMER	1 ATS voice – A	
5	Peru (Lima) / United States	1 AFTN data, 2400 bps, X25, IA-5	
6	United States / Brazil	1 AFTN data, 2400 bps, X25, IA-5	

* Colombia will examine the amount of channels it will need to meet these requirements through the interconnection.

APPENDIX B: CIRCUIT REQUIREMENTS

D: Indicates requirements for instantaneous communications.
A: Indicates ATS requirements for voice communications which should be established in 15 seconds.

Table 3 – CAR/SAM AFS interconnection requirements in the Tegucigalpa, COCESNA MEVA II node

No.	CAR/SAM	Required AFS Circuits	Remarks
1	2	3	4
1	Cenamer / Bogota, Colombia	1 ATS voice– A	
2	Cenamer / Guayaquil, Ecuador	1 ATS voice – A	

A: Indicates ATS requirements for voice communications which should be established in 15 seconds.

Table 4 – Interconnection Impact in the Curacao, Kingston, Miami, San Juan and Panama MEVA II nodes

No.	CAR/SAM	Required AFS Circuits	Remarks
1	2	3	4
1	Aruba, Aruba	1 ATS voice– A	Circuits with Josefa Camejo, Venezuela
2	Curacao, Netherlands Antilles	1 ATS voice – A 1 AFTN data	Circuits with Venezuela
3	Kingston, Jamaica	1 ATS voice – A	Circuits with Colombia
4	Miami, United States	2 AFTN data	Circuits with Brazil and Peru
5	Panama, Panama	2 ATS voice – A 1 AFTN data	Circuits with Colombia
6	San Juan, Puerto Rico	1 ATS voice – A 1 AFTN data	Circuits with Venezuela

A: Indicates ATS requirements for voice communications which should be established in 15 seconds.

Peru/USA is a 9.6kbps AFTN circuit.

APPENDIX C: ESTIMATED EQUIPMENT REQUIREMENTS

ESTIMATED EQUIPMENT REQUIREMENTS

EQUIPMENT NECESSSARY IN REDDIG NODE DUE TO MEVA II / REDDIG INTERCONECTION
EQUIPAMIENTO NECESARIO EN LOS NODOS REDDIG DEBIDO A LA INTERCONEXION MEVA II / REDDIG

ESTADO/STATE		NÚMERO DE CIRCUITOS REQUERIDOS / NUMBER OF CIRCUITS REQUIRED		NUMERO DE TARJETAS Y EQUIPOS REQUERIDOS PARA LA INTERCONEXIÓN / NUMBER OF CARDS AND EQUIPMENT REQUIRED					
				FRAD MEMOTEC CX950			MODEM LINKWAY 2100	SPLITTER	SSPA 75W
		ORAL ATS / ATS SPEECH	AFTN	E1 DIM VOICE MOD.	ANALOG VOICE CARD DAV	I/O Multi			
Argentina									
Bolivia									
Brasil / Brazil	Manaos		1						
	Curitiba								
	Recife								
Chile									
Colombia		4	3	2			1	1	1**
Ecuador		1		2*					
Guyana									
Guyana Francesa / French Guiana									
Paraguay									
Perú			1						
Surinam									
Uruguay									
Venezuela		3	2		4		1	1	1**

* Confirmation in the node is pending / Falta confirmación en el nodo
** Uplink satellite budget is pending / Falta comprobar a través de un análisis de enlace satelital

APPENDIX C: ESTIMATED EQUIPMENT REQUIREMENTS

EQUIPMENT NECESSSARY IN MEVAII NODE DUE TO MEVA II / REDDIG INTERCONECTION
EQUIPAMIENTO NECESARIO EN LOS NODOS MEVA II DEBIDO A LA INTERCONEXION MEVA II / REDDIG

ESTADO/STATE	NUMERO DE CIRCUITOS REQUERIDOS NUMBER OF CIRCUIT REQUIRED		NUMERO DE TARJETAS Y EQUIPOS REQUERIDOS PARA LA INTERCONEXIÓN /NUMBER OF CARDS AND EQUIPMENTS REQUIRED					
			FRAD MEMOTEC			MODEM LINK WAY 2100	SPLITTER	SSPA 75W
	ORAL ATS / ATS SPEECH	AFTN	E1 DIM VOICE MOD.	ANALOG VOICE CARD DAV	I/O Multi			
Aruba								
Cuba								
Curazao / Curacao	1			1*				
Gran Caimán / Grand Cayman								
Haiti								
Honduras	2			1*		1	1	1**
Jamaica	1			1*				
Miami		2						
Panamá	2	1		1*	1*			
Puerto Rico	1	1		1*	1*			
Republica Dominicana / Dominican Republic								

* Confirmation in the node is pending / Falta confirmación en el nodo
** Uplink satellite budget is pending / Falta comprobar a través de un análisis de enlace satelital

APPENDIX D: GLOSSARY OF TERMS AND ABBREVIATIONS

GLOSSARY OF TERMS AND ABBREVIATIONS

ACC	Area Control Center
ADPCM	Adaptive Differential PCM
AFSS	Aeronautical Flight Service Station (FAA)
AFTN	Aeronautical Fixed Telecommunications Network
ANSI	American National Standards Institute
ARTCC	Air Route Traffic Control Center (FAA)
ATN	Aeronautical Telecommunications Network
BER	Bit Error Rate
BoD	Bandwidth on Demand
CAA	Civil Aviation Administration
CAR/SAM	Caribbean/South American
CCITT	ITU Consultative Committee on International Telephone and Telegraph
CELP	Code Excited Linear Prediction
CNS	Communications, Navigation and Surveillance
CODEC	Coder-Decoder
COTS	Commercial Off The Shelf
CPDLC	Controller-Pilot Data Link Communications
DAMA	Demand Assigned Multiple Access
DCA	Director of Civil Aviation
DTMF	Dual Tone Multi-Frequency
Eb/No	Energy per bit divided by Noise spectral density
FAA	Federal Aviation Administration
FR	Frame Relay
FRAD	Frame Relay Access Device
FXO	Foreign Exchange Operation
FXS	Foreign Exchange Signaling
GNSS	Global Navigation Satellite System
GREPECAS	CAR/SAM Regional Planning and Implementation Group
ICAO	International Civil Aviation Organization
IDU	Indoor Unit
IFL	Inter-facility Link
ITU	International Telecommunications Union
Kbps	Kilobits per second
LMI	Local Management Interface
MEVA	Mejoras al Enlace de Voz del ATS Project
MRT	Master Reference Terminal
MTBF	Mean Time Between Failure
MTTR	Mean Time To Repair
M&C	Monitor and Control
NACC	North American, Central American, and Caribbean (Office)
NADIN	NAS Aeronautical Digital Information Network
NAS	National Airspace System
NCC	Network Control Center

APPENDIX D: GLOSSARY OF TERMS AND ABBREVIATIONS

NCS	Network Control System
NMS	Network Management System
ODU	Outdoor Unit
PABX	Private Automatic Branch Exchange
PSTN	Public Switched Telephone Network
PTT	Post, Telephone and Telegraph
PVC	Permanent Virtual Circuit
RELP	Residual Excited Linear Predictive (coding)
SCPC	Single Channel Per Carrier
SRT	Secondary Reference Terminal
SVC	Switched Virtual Circuit
TDMA	Time Division Multiple Access
TMG	Telecommunications Management Group
UPS	Uninterruptible Power Supply
VSAT	Very Small Aperture Terminal

APPENDIX 1B

ANSWERS TO QUESTIONS FROM AGS CONCERNING THE MEVA II/REDDIG INTERCONNECTION RFP

Question 1:
1. Section 2.1.2 (Key Requirements...), page 8 and Appendix A (subsection- Network Protocol and Services), page 18 state that the interconnection shall be capable of using ...ATM... Given that Viasat no longer manufactures ATM cards nor supports them, please clarify this requirement.

ANSWER 1: This requirement has been included considering the actual equipment capacities (as reference in the Linkway 2100 modem manual and website). If today Viasat, Linkway 2100 Manufacturer, no longer manufactures ATM cards, please indicate and detail it in your proposal.

Question 2:
2. The current REDDIG allocated bandwidth is 4.38 MHz (page 5, section 1.4.1.4) with 2x1.25 and 1x0.625 Msym/s carriers (page5). What is the projected bandwidth allocation for the next 2 years? Is AGS required to implement more efficient carrier groupings such as 2.5 Msym/sec?

ANSWER 2: The projected bandwidth allocation for the next two years is 4.950 MHz. AGS is not required to implement carriers of 2.5 MSYM/S.

Question 3:
3. The REDDIG network uses dual redundant FRAD (section 1.4.1.2, line 1). Is the REDDIG modem in Cocesna required to implement dual redundant FRAD?

ANSWER 3: As in MEVA present configuration, no redundant equipment configuration is requested.

The REDDIG modem in COCESNA is not required to implement dual redundant frad. (Appendix C of the RFP and Appendix B of the report on Agenda Item 1 of the Fourth MEVAII/REDDIG Coordination Meeting)

Question 4:
4. The REDDIG VSAT terminals are equipped for 1 for 1 chain redundancy (section 1.4.1.4, page 5). Is the REDDIG chain in COCESNA required to implement 1 for 1 chain redundancy?

ANSWER 4: As in MEVA present configuration, no redundant equipment configuration is requested.

The REDDIG chain in COCESNA is not required to implement 1:1 redundancy. (Appendix C of the RFP and Appendix B of the Report on Agenda Item 1 of the Fourth MEVAII/REDDIG Coordination Meeting)

Question 5:
5. AGS needs the REDDIG dial plan for voice circuits so that REDDIG and MEVA-II dial plans do not have conflicts.

ANSWER 5:

REDDIG Dial Plan		
Country, Location	**Node**	**Voice Dial Code**
Argentina, Ezeiza	**SAEZ**	**20**
Bolivia, La Paz	**SLLP**	**25**
Brazil, Manaus	**SBMN**	**36**
Brazil, Recife	**SBRF**	**38**
Brazil, Curitiba	**SBCT**	**30**
Chile, Santiago	**SCEL**	**40**
Colombia, Bogotá	**SKED**	**45**
Ecuador, Guayaquil	**SEGU**	**50**
Guyana, Georgetown	**SYGC**	**90**
French Guyana, Cayenne	**SOCA**	**92**
Paraguay, Asunción	**SGAS**	**55**
Peru, Lima	**SPIM**	**60**
Surinam, Paramaribo	**SMPM**	**94**
Uruguay, Montevideo	**SUMU**	**65**
Venezuela, Maiquetia	**SVMI**	**80**
Trinidad and Tobago, Piarco	**TTZP**	**91**

Question 6:
6. General question: Can you provide details of the AFTN in the REDDIG network?

ANSWER 6: All AFTN circuits (user side) in the REDDIG network have the following parameters:

Electrical Interface: RS232 / V.24
Mechanical Interface: DB-25
Rate: 2400 bps
Protocol: asynchronous, 8 bits, NP, 1 stop bit

Note.- FRAD ports (network side) for such AFTN circuits employ internal x.25 protocol in addition to the async driver and pad.

Question 7:
7. 2.1.2.4 Consideration of MEVAII and REDDIG NCC/NMS
The term SRT do you mean AMRT? Viasat use the term SRT for Supporting Reference Terminal.

ANSWER 7: Please referred to the Glossary provided in the RFP, in which SRT means Secondary reference Terminal. For the following references using the SRT term, please replaced this term with the term AMRT (alternate master reference terminal):
Page 10, paragraph 2.1.2.6
Page 11, paragraph 2.1.2.8
Page 12 and
Page 17

The REDDIG does not employ a SRT which is used in multiple-beam configuration to control the traffic terminals that the MRT can not see.

In any case, the glossary of terms with respect to MRT, AMRT, SRT and other relative concepts must be clearly defined in your proposal taking in consideration the terms of the *LINKWAY system specifications.*

Question 8:
8. The use of NCC is used to describe to different things and can be confusing to the RFP reader. Can you use NCC to describe the Sun server that controls the MEVAII and REDDIG networks and use TOC to describe the AGS 24x7x365 operations center that is manned to support the MEVAII/REDDIG interconnection network? AGS operates an NCC and an alternate NCC but does not have an alternate TOC.

ANSWER 8: OK, please present this information and details in your proposal.

The term NCC will be used to describe the sun server and the term TOC to describe the AGS 24 X 7 X 365 operations center.

Manaos, Brazil is the main NCC with local redundancy. Ezeiza, Argentina is the alternate NCC with local redundancy.
The REDDIG operations center is in Manaos, however, if required, an alternate operations center in Ezeiza can be activated.

Question 9:
9. Appendix B Table 2

Row 5 and 6 MEVAII will interconnect the REDDIG at Columbia and Venezuela. How will the traffic get to Lima, Peru, and Brazil? Is the use of a double hop for these sites acceptable?

ANSWER 9: The AFTN traffic from USA to Peru and Brazil will pass through Colombia MEVA II node to the REDDIG network.
As these are data circuits carrying message traffic, there would not be a problem to use a double hop. However, it is recommendable to do an analysis at this respect.

The AFTN circuits PERU-USA and Brazil-USA will be configured in this form:

Two additional AFTN circuits will be programmed in the REDDIG network: Peru-Colombia and Brazil-Colombia

In Colombia, each additional AFTN traffic will be extracted from one port of the frad equipment and connected to another port of the same FRAD equipment.
From here, Colombia MEVA II node, both mentioned AFTN traffic will be linked to USA MEVA II node for final destination.

APPENDIX 1C

RESPUESTAS A LAS PREGUNTAS FORMULADAS POR EL ADMINISTRADOR DE LA REDDIG SOBRE EL NODO MEVA II DE COCESNA

1. Energía Primaria

a. Voltaje AC y Frecuencia
Respuesta: 110 VAC, 60 HZ

b. Tipo de toma corriente (AC outlet) en el Rack de equipos
Respuesta: NEMA 5-15 (ver fotos adjuntas)

c. Número de tomas disponibles en el Rack de equipos
Respuesta: Uno toma en regleta existente dentro del rack

2. Rack de equipos

a. Espacio (unidades de rack) disponibles para montaje de equipos adicionales
Respuesa: Actualmente hay un espacio disponible de 5Us de rack, ver fotos, dos U arriba del Linkway y 3U debajo de este equipo

b. Planos de vista frontal y posterior del Rack de equipos
Respuesta: Ver esquemas adjuntos

3. Equipo Memotec CX-950e

a. Software/Application Revision
Respuesta: Application Version: 4.5.2

b. Tarjetas I/O instaladas y en que "slot" está cada una
Respuesta:
Slot 1: tarjeta V.35H
Slot 2: tarjeta V.24
Slot 7: tarjeta DAV
Slot 8: tarjeta DAV

c. Número de "slots" disponibles para instalación de Tarjetas I/O adicionales
Respuesta: 4 slots

d. Información del equipo: "sysinfo" y "module"
Respuesta: Se adjunta fichero denotado: "sysinfo y module (Memotec Honduras)"

e. Archivos de configuración del equipo: ".cxt" y ".txt"
Respuesta: Se adjunta el fichero: "custom (Memotec Honduras) "equivalente al archivo ".txt". El archivo ".cxt" no se tiene ya que la herramienta CxTool no se dispone en sitio, en todo caso se ha consultado a la empresa prestadora de servicios MEVA

f. Versión de la herramienta de configuración CxTool con el que se generó la configuración
Respuesta: No se dispone en sitio de la herramienta CxTools

4. Conmutador/Central de Voz

a. Interfaces disponibles para dos (2) circuitos ATSa en el Conmutador/Central de Voz
Respuesta: En el Conmutador/Central de voz en CENAMER se cuenta con interfaces del tipo FXO

b. Interfaz disponible para un (1) circuito de mantenimiento/administrativo
Respuesta: Actualmente los canales o circuitos de mantenimiento de nuestros equipos de comunicaciones, como el caso de MEVA, están interconectados a nuestra planta telefónica (PABX) la cual recibe el canal a través de interfaces configuradas como FXO, por lo tanto la línea proveniente de la VSAT deberá ser del tipo FXS

c. Longitud del cableado desde el MDF del Conmutador/Central hasta el Rack de equipos
Respuesta: La distancia es de unos 50 mts aproximadamente, sin embargo ya se dispone de unos cables multipares desde la ubicación MEVA II hasta nuestro Conmutador/Central de Voz para realizar este tipo de implementación de canales futuros

APPENDIX 1D

International Civil Aviation Organization | Organisation de l'aviation civile internationale | Organización de Aviación Civil Internacional | Международная организация гражданской авиации | منظمة الطيران المدني الدولي | 国际民用航空组织

Ref.: N 1/3.6.3 – **EMX0886** 19 September 2007

To: Mr. David Benning
Senior Account Executive, Civil Sales
Americom Government Services
United States
david.benning@americom-gs.com

cc:

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Onofrio Smarrelli, RO/CNS, Lima	os@lima.icao.int;

ICAO RD, Lima *(For onward transmission to Panama)*

Subject: **MEVA II/REDDIG Interconnection RFP – Memotec 950 and CPU rev and software version**

Dear Mr. Benning,

Regarding your message dated 18 September 2007, on the aforementioned subject, attached please find the requested REDDIG information on the Colombia and Venezuela nodes.

Accept, Sir, the assurances of my highest consideration.

for
Loretta Martin
Regional Director
ICAO NACC Office

North American, Central American and Caribbean Office
Av. Presidente Masaryk No. 29 3er. Piso
Col. Chapultepec Morales
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827 Union Pacific
Laredo, Tx,
78045-9452
U.S.A.

COLOMBIA FRAD

SKED-MPS-A>sysinfo

Motherboard:CX950 Access Switch, Rev:2, ECO:0, Id:30213003
Bootcode Revision: Sep 25 2001 11:47:24 3.1 (Build:1)
Bootcode Checksum:0xB98E35
CPU Name:MPC603E, Version:00071201, Frequency:200MHz
System memory:32 MB, FLASH memory:4 MB
Code:3342/3392 KB, Binary Config:38.9/640 KB, Custom Script+Database:(0.0+0.0)/64 KB
Watch Dog Jumper:Absent
Cache Mode:Enabled
Data Buffers are: Not Cached
Application Version: 4.2.2 (XP30422K)
May 11 2005 12:31:15 Diab4.2b
Application Checksum:0x17D150B8, Size:03422667
Application Features: VOIP/G.729/6DIM

Slot # : I/O Card Type	I/O : Rev
1 : 10 Mbps ETHERNET (14)	: 0.1
2 : EMPTY SLOT (31)	
3 : MULTI-V.24 (4)	: 1.0
4 : MULTI-V.24 (4)	: 1.0
5 : ISDN BRI-ST (18)	: 0.1
6 : Universal I/O (7)	: 1.3
7 : MULTI-V.24 (4)	: 1.0
8 : C54 T1/E1 Digital Interface Module (29)	: 1.2

SKED-MPS-B>sysinfo

Motherboard:CX950 Access Switch, Rev:2, ECO:0, Id:30213003
Bootcode Revision: Sep 25 2001 11:47:24 3.1 (Build:1)
Bootcode Checksum:0xB98E35
CPU Name:MPC603E, Version:00071201, Frequency:200MHz
System memory:32 MB, FLASH memory:4 MB
Code:3342/3392 KB, Binary Config:39.0/640 KB, Custom Script+Database:(14.4+13.8)/64 KB
Watch Dog Jumper:Absent
Cache Mode:Enabled
Data Buffers are: Not Cached
Application Version: 4.2.2 (XP30422K)
May 11 2005 12:31:15 Diab4.2b
Application Checksum:0x17D150B8, Size:03422667
Application Features: VOIP/G.729/6DIM

Slot # : I/O Card Type	I/O : Rev
1 : 10 Mbps ETHERNET (14)	: 0.1
2 : EMPTY SLOT (31)	
3 : MULTI-V.24 (4)	: 1.0
4 : MULTI-V.24 (4)	: 1.0
5 : ISDN BRI-ST (18)	: 0.1
6 : Universal I/O (7)	: 1.3
7 : MULTI-V.24 (4)	: 1.0
8 : C54 T1/E1 Digital Interface Module (29)	: 1.2

VENEZUELA FRAD

SVMI-MPS-A>sysinfo

Motherboard:CX950 Access Switch, Rev:2, ECO:0, Id:30213003
Bootcode Revision: Sep 25 2001 11:47:24 3.1 (Build:1)
Bootcode Checksum:0xB98E35
CPU Name:MPC603E, Version:00071201, Frequency:200MHz
System memory:32 MB, FLASH memory:4 MB
Code:3342/3392 KB, Binary Config:39.1/640 KB, Custom Script+Database:(0.0+0.0)/64 KB
Watch Dog Jumper:Absent
Cache Mode:Enabled
Data Buffers are: Not Cached
Application Version: 4.2.2 (XP30422K)
May 11 2005 12:31:15 Diab4.2b
Application Checksum:0x17D150B8, Size:03422667
Application Features: VOIP/G.729/6DIM

Slot # : I/O Card Type	I/O : Rev
1 : EMPTY SLOT (31)	
2 : MULTI-V.24 (4)	: 1.0
3 : MULTI-V.24 (4)	: 1.0
4 : MULTI-V.24 (4)	: 1.0
5 : Universal I/O (7)	: 1.3
6 : ISDN BRI-ST (18)	: 0.1
7 : C54 Dual Analog Voice (13)	: 2.0
8 : C54 Dual Analog Voice (13)	: 2.0

SVMI-MUX-A>sysinfo

Motherboard:CX950 Access Switch, Rev:2, ECO:0, Id:30213003
Bootcode Revision: Sep 25 2001 11:47:24 3.1 (Build:1)
Bootcode Checksum:0xB98E35
CPU Name:MPC603E, Version:00071201, Frequency:200MHz
System memory:32 MB, FLASH memory:4 MB
Code:3342/3392 KB, Binary Config:31.9/640 KB, Custom Script+Database:(0.0+0.0)/64 KB
Watch Dog Jumper:Absent
Cache Mode:Enabled
Data Buffers are: Not Cached
Application Version: 4.2.2 (XP30422K)
May 11 2005 12:31:15 Diab4.2b
Application Checksum:0x17D150B8, Size:03422667
Application Features: VOIP/G.729/6DIM

Slot # : I/O Card Type	I/O : Rev
1 : 10 Mbps ETHERNET (14)	: 0.1
2 : V.35H (5)	: 1.0
3 : EMPTY SLOT (31)	
4 : EMPTY SLOT (31)	
5 : EMPTY SLOT (31)	
6 : EMPTY SLOT (31)	
7 : C54 Dual Analog Voice (13)	: 2.0
8 : C54 Dual Analog Voice (13)	: 2.0

SVMI-MPS-B>sysinfo

Motherboard:CX950 Access Switch, Rev:2, ECO:0, Id:30213003
Bootcode Revision: Sep 25 2001 11:47:24 3.1 (Build:1)
Bootcode Checksum:0xB98E35
CPU Name:MPC603E, Version:00071201, Frequency:200MHz
System memory:32 MB, FLASH memory:4 MB
Code:3342/3392 KB, Binary Config:39.1/640 KB, Custom Script+Database:(0.0+0.0)/64 KB
Watch Dog Jumper:Absent
Cache Mode:Enabled
Data Buffers are: Not Cached
Application Version: 4.2.2 (XP30422K)
May 11 2005 12:31:15 Diab4.2b
Application Checksum:0x17D150B8, Size:03422667
Application Features: VOIP/G.729/6DIM

Slot # : I/O Card Type	I/O : Rev
1 : EMPTY SLOT (31)	
2 : MULTI-V.24 (4)	: 1.0
3 : MULTI-V.24 (4)	: 1.0
4 : MULTI-V.24 (4)	: 1.0
5 : Universal I/O (7)	: 1.3
6 : ISDN BRI-ST (18)	: 0.1
7 : C54 Dual Analog Voice (13)	: 2.0
8 : C54 Dual Analog Voice (13)	: 2.0

SVMI-MUX-B>sysinfo

Motherboard:CX950e Access Switch, Rev:4, ECO:1, Id:30273003
Bootcode Revision: Feb 21 2003 13:08:39 XP04.0 (Build:2)
Bootcode Checksum:0x9B9A46
CPU Name:MPC745, Version:00083203, Frequency:333MHz
System memory:64 MB, FLASH memory:4 MB
Code:3459/3520 KB, Binary Config:32.5/512 KB, Custom Script+Database:(0.0+0.0)/64 KB
Watch Dog Jumper:Absent
Cache Mode:Enabled
Data Buffers are: Not Cached
Application Version: 4.3.5 (XP50435H)
Nov 15 2005 10:04:42 Diab4.2b
Application Checksum:0x18B24F61, Size:03542547
Application Features: VOIP/G.729/V110/8DIM
SEM is not present

CPU - Checksum, Number

Slot # : I/O Card Type	(ID) : Rev
1 : 10 Mbps ETHERNET	(14) : 0.1
2 : V.35H	(5) : 1.0
3 : EMPTY SLOT	(31) :
4 : EMPTY SLOT	(31) :
5 : EMPTY SLOT	(31) :
6 : EMPTY SLOT	(31) :
7 : C54 Dual Analog Voice	(13) : 2.0
8 : C54 Dual Analog Voice	(13) : 2.0

APPENDIX 1E

Answers to the New Additional Questions by the MEVA II Service Provider on the MEVA II / REDDIG RFP (received on 27 September 2007)

1) What are the specs / power rating of REDDIG Interconnect sites?

Answer: *Venezuela 110VAC 60Hz*
Colombia 110VAC 60Hz

2) What is the type and length of the IFL that is run at the REDDIG Interconnect sites?

Answer: *Type of IFL cable is RA 519*
Length of IFL cable has to be confirmed during the site survey. As a reference, the length of cables indicated before REDDIG implementation were 29 meters for Colombia station and 50 meters for Venezuela station.

3) How much open rack space is available at the REDDIG Interconnect sites?

Answer: *Please see attachments at this respect.*

4) How many empty cards slots are available at the REDDIG additional circuit sites?

Answer: *At Venezuela station, four (4) empty cards slots at the FRAD (MUX) equipment.*
At Colombia station, three (3) empty daughterboards DVP slots at the DIM Module of FRAD (MPS)

5) We understand Colombia and Venezuela to be chain redundant. Does this include the IFL?

Answer: *Yes*

6) Please provide a block diagram of Colombia and Venezuela that shows switching between components.

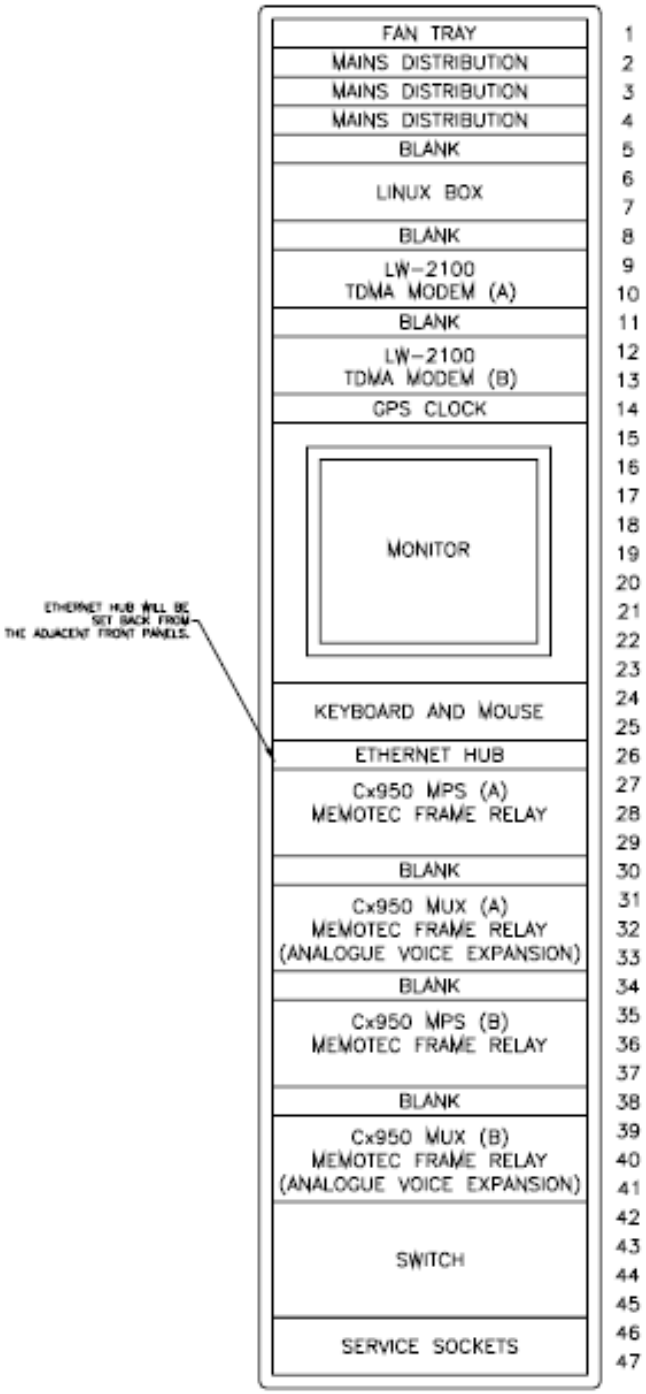
Answer: *Please see the attachment at this respect.*

7) Is the connectivity from Peru, Ecuador and Brazil through Bogotá via the REDDIG network? Or, is this a terrestrial circuit?

Answer: *It is through REDDIG network*
Peru and Brazil AFTN circuits will be connected via REDDIG to Bogota station for interconnection purposes (The circuits will not pass through the AFTN Switching Centre of Bogotá, these circuits will be commutate to MEVAII MODEM via the MEMOTEC FRAD)
Ecuador circuit (ATSa) will not pass through Colombia station for interconnection purposes. Ecuador circuit (ATSa) will be interconnected to COCESNA/REDDIG station

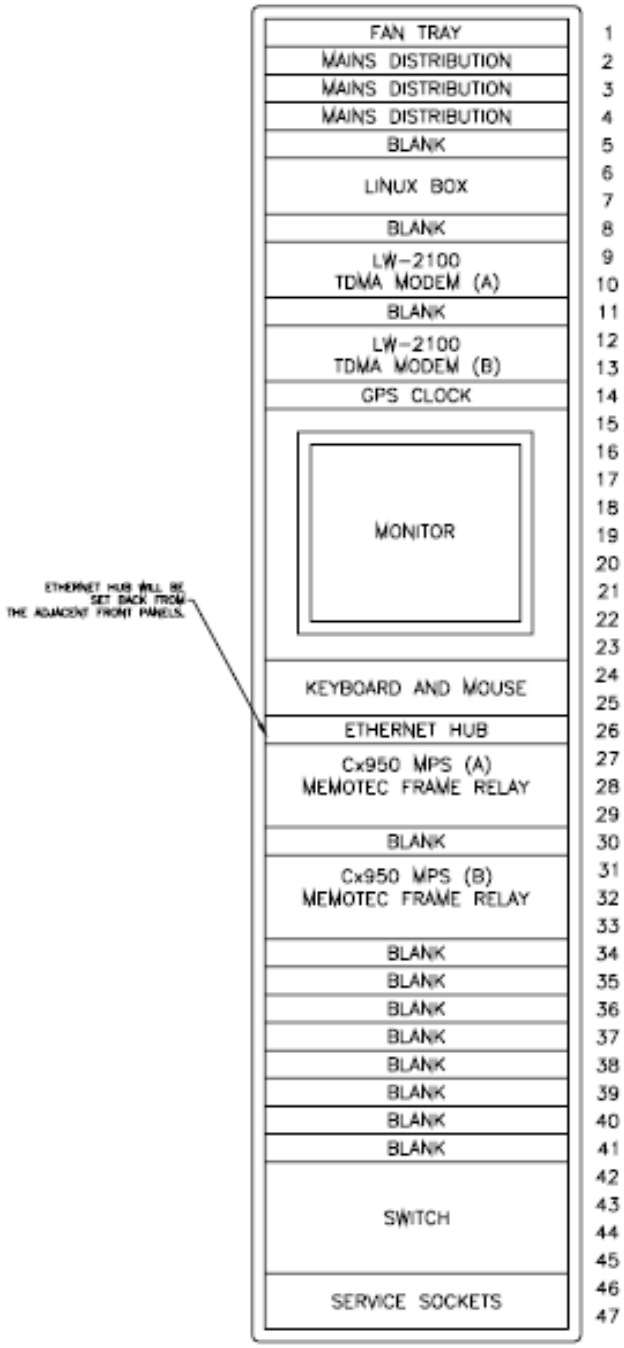
Venezuela - Station Rack

* GPS Clock not installed

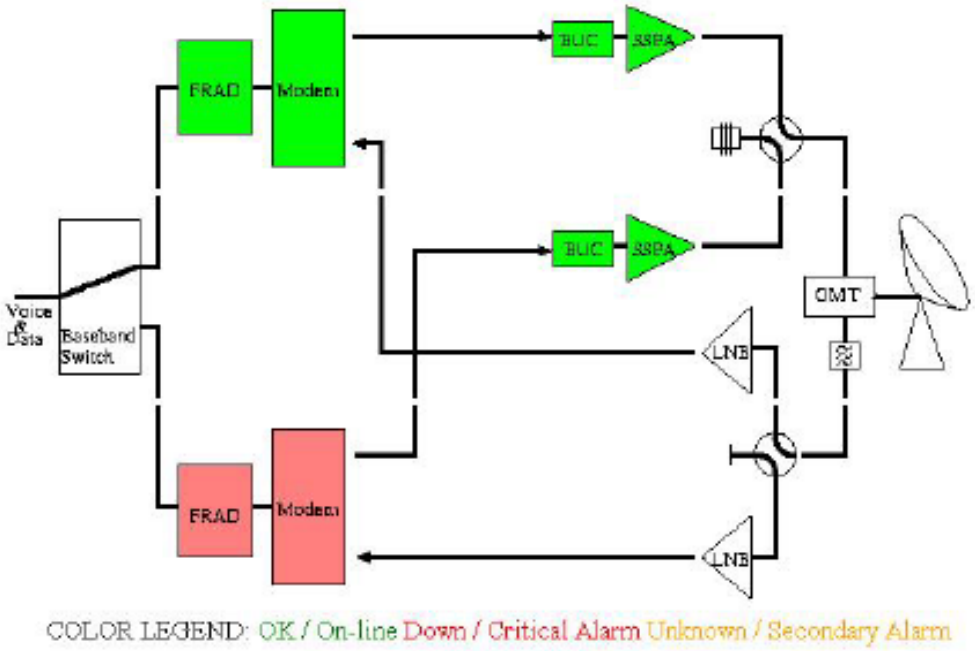


Colombia - Station Rack

* GPS Clock not installed



Block diagram for Colombia and Venezuela stations



APPENDIX 1F

COMMENTS TO THE RESPONSE OF THE MEVA II SERVICE PROVIDER

Technical proposal:

a) complete the studies necessary, which either guarantee or not, the replacement of the current 40 W amplifiers in the COCESNA MEVA II node, as well as in the Caracas REDDIG node for 80 W amplifiers;

b) contemplate for the Caracas and Bogotá REDDIG nodes only, one MODEM as specified in Appendix C to the RFP and in Appendix B to Agenda Item 1 to the Report of the Fourth MEVA II / REDDIG Coordination Meeting;

c) modify the number of Frame Relay circuits (ATS voice circuits) between Bogotá and Panama in accordance with the specifications contained in Appendix B to the RFP, Table 2 (see the remarks column), and in Appendix C to the RFP. Install four Frame Relay circuits. Review the additional equipment needed in Panama as a consequence of this change;

d) in the implementation of the AFTN circuits in Brazil, Peru and the United States via Bogotá, Colombia, the REDDIG Administration will implement, if necessary, the equipment in the Peru and Brazil REDDIG nodes, the Frame Relay circuit programming between Peru-Colombia and Brazil-Colombia, as well as the FRAD technical arrangements in Bogotá and the connection to the MEVA II MODEM;

e) in MEVA II, the use of a carrier with capacity of 2.5 symbols per second should not be considered, as indicated in the response issued by the Third Meeting of the MEVA II / REDDIG interconnection Task Force to questions formulated by the MEVA II Service Provider to the RFP (Ref. Appendix B to this part of the Report);

f) complete the necessary studies in order to determine that the MEVA II network MRT and AMRT are not simultaneously affected by the sun-outage phenomenon;

g) considering the procedures established in the RFP for aspects of maintenance, it is necessary to establish a voice channel between the MEVA II NCC and REDDIG as well as a voice channel between the MEVA II NCC with the REDDIG nodes of Bogotá and Caracas;

h) include in the RFP response the table of Credit Requirement Accomplishments specified in Section 2 of the RFP; and

i) update the programme of activities described in a) to h) above using the MS Project Management software.

Economic proposal:

a) in the non-recurrent costs proposal included in Section II, Table 1 (Summary of the non-recurrent costs for the MEVA II REDDIG interconnection) considering to eliminate network integration costs, which include the installation and trips to Peru and Brazil, based on the observations contained in the Technical Proposal of the Brazil and Peru AFTN circuits;

b) review the Site Survey costs as well as COCESNA's integration costs shown in Table 1 of Section II, considering that the MEVA II Service Provider is already familiar with the COCESNA MEVA II node;

c) in Table 1 of Section II, delete all non-recurrent costs associated with Ecuador in view that all will be the responsibility of the REDDIG Administration;

d) detail unitary prices of equipment and services proposed in Table 1 of Section II;

e) in Table 2 of Section II, review monthly costs of network access taking into account costs presented by the MEVA II Service Provider in the Fourth MEVA II /REDDIG Coordination Meeting held in Lima, Peru, from 7 to 9 March 2007; and

f) update the recurrent costs presented in Table 2 of Section II in accordance with the changes performed by the technical proposal.

APPENDIX 1G

INTERNATIONAL CIVIL AVIATION ORGANIZATION

RLA/03/901 PROJECT
REDDIG MANAGEMENT SYSTEM AND SATELLITE SEGMENT ADMINISTRATION

TECHNICAL-ECONOMICAL PROPOSAL FOR MEVA II AND REDDIG NETWORKS INTERCONNECTION

OPERATION OF COCESNA NODE AT REDDIG

September 2007

CONTENTS

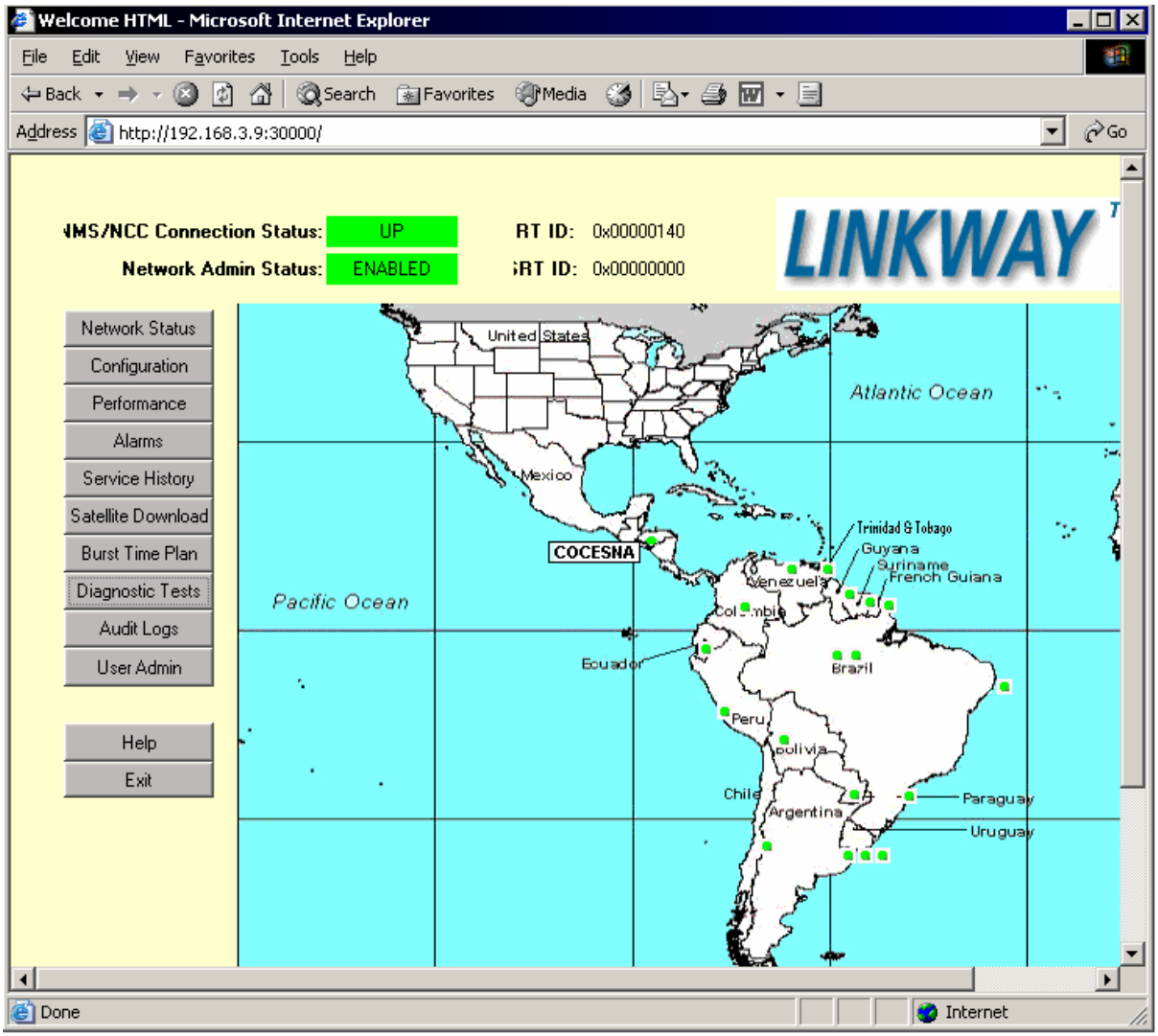
1. PRESENTATION

1.1 REDDIG administration, in representation of project RLA/03/901, presents its Technical-Economical Proposal for the operation of the COCESNA node in the REDDIG network, meeting the RFP technical requirements with the highest availability, reliability and quality standards that REDDIG has been providing since 2003 to the aeronautical telecommunications services of thirteen South American States and one Caribbean State.

1.2 The REDDIG digital network is the result of the cooperation among participant States and those interested in having the objective of sharing an owned network that provides modern current and future aeronautical telecommunications services.

1.3 REDDIG administration, under ICAO RLA/03/901 Regional Technical Cooperation Project, manages a non-profit making integral operation of the network and administrates the corresponding satellite segment.

1.4 Below is a map indicating the REDDIG nodes being currently operated, and the future COCESNA node.



2. TECHNICAL PROPOSAL

2.1 Executive summary

2.1.1 On the basis of the COCESNA node communications requirements for the interconnection of MEVA II / REDDIG networks and of the technical premises indicated in this proposal, the integral solution consists in the provision, installation and tests of the equipment described in paragraph 2.5.1.1, as well as the operation of the COCESNA node within REDDIG, from hereon COCESNA/REDDIG node, with the highest availability, reliability and quality standards of the services to be rendered by the network.

2.1.2 The solution presented takes into consideration the maximum use of the equipment currently available in the COCESNA/MEVA II. An additional Linkway 2100 modem will be used with the current RF chain, which is supported by the link budget analyses carried out to this effect. In addition, the slots available in the current FRAD equipment will be used to install additional cards that will support the COCESNA/REDDIG node communications channels.

2.1.3 In addition to the two ATS-exclusive voice channels, an on net administrative voice channel is included for the carrying out of tasks and maintenance coordinations, with the consequent savings in international long distance calls.

2.1.4 The installation of equipment in the node will be carried out in coordination with COCESNA and the MEVA II service provider, with the aim of reducing to a minimum the interruption period of its communications services. The satellite line up tests and the start up of the COCESNA/REDDIG node will be carried out under the coordination and supervision of the REDDIG Centre of Operations.

2.1.5 The COCESNA/REDDIG node will have all the technical facilities as REDDIG, such as 24x365 technical support from the Manaus-Brazil Centre of Operations, the geographical redundancy from the network's Master Reference Terminal, local redundancy from the NCCs from both Manaus-Brazil and Ezeiza-Argentina and, if required, the activation of the alternate Centre of Operations in Ezeiza.

2.1.6 Taking into consideration that all REDDIG nodes have redundant equipment configuration, providing the COCESNA/REDDIG node with greater communications availability with its counterpart nodes, the option of purchasing a Linkway 2100 modem as a spare equipment is presented, which would permit backing up any MEVA II or REDDIG modems, and thus improving the availability of the COCESNA node, in general.

2.2 Interconnection requirements at COCESNA node

2.2.1 In accordance to Table 3 in Appendix B to the RFP document, the communications requirements of COCESNA are:

(1) ATS voice channel with the Bogota, Colombia, control centre; and
(1) ATS voice channel with the Guayaquil, Ecuador, control centre.

2.3 **Technical premises for the operation of the COCESNA node at REDDIG**

a) That the COCESNA node operates on the IS-1R satellite, using C band transponders with US/Latin America hemisphere beam and co-lineal vertical polarization.

b) That the COCESNA node use a 3.8 m in diameter antenna with a 40 Watts and integrated BUC power amplifier.

c) That MEVA II network use carriers of up to 1.25Msym/s with QPSK modulation and 1/2 FEC.

d) That the Memotec CX-960e equipment in COCESNA be 100% interoperable with Memotec CX-950 equipment.

e) That the Memotec CX-960e equipment in COCESNA have slots available for the installation of additional cards to operate in REDDIG.

2.4 **Solution design**

The objective of the technical solution design is to maximize the use of the current equipment in the COCENA node, with the additional equipment necessary for the node to operate in REDDIG.

2.4.1 **Use of the current RF chain with 40 Watts amplifier and LNB**

2.4.1.1 To this end, the following satellite link budget calculations have been carried out from the COCESNA node station to:

- Manaus
- Bogota
- Guayaquil
- Miami
- Panama
- Kingston
- La Habana

2.4.1.2 *Appendix A* presents the referred link calculations.

2.4.1.3 Obtained results in each of the links:

Availability of compound link (UpLink + DnLink): **99.995%**
BER: **1xE-8**

2.4.1.4 Parameters used in the link calculations:

Satellite: IS-1R
Uplink Beam: US_LAM_CVUP; Uplink Pol: V; Uplink Channel: 3C
Dnlink Beam: US_LAM_CVDN; Dnlink Pol: V; Dnlink Channel: 4C
Symbol Rate: 1.25 Msps <> Info Rate: 1144 Kbps
Modulation: QPSK
Inner FEC: Viterbi 1/2
Outer FEC: RS (236,216)
Required C/N: 4.3dB
System Margin: 1.0dB

2.4.1.5 Analysis of the power consumption in the COCESNA node transmitter

The sum of the highest feed flange values in each network is 10.3 Watts (10.12 dBW) during both networks simultaneous operation.

2.4.1.6 *Considering*:

Transmitter power:	16.02dBW
Transmitter backoff for 2 carriers:	5dB (3dB minimum)
Loss from transmitter exit to feed flange:	0.5 dB

2.4.1.7 *You have*:

Power required for transmitter exit:	10.62 dBW
Transmitter available power:	11.02 dBW

2.4.1.8 *Therefore*:

The transmitter will be able to operate simultaneously with two carriers of up to 1.25Msym/s with QPSK modulation and 1/2 FEC.

2.4.2 **Provision of one (1) Linkway 2100 modem with one (1) ground frame relay protocol interface**

2.4.2.1 In the satellite segment, the Linkway 2100 model will operate in any of the three REDDIG carriers, 2x1.25Msps and 1x0.625Msps, with MF-TDMA (MultiFrequency-Time Division Multiple Access).

2.4.2.2 The REDDIG NCC will control, monitor and manage the satellite access, as well as dynamically assign the band width, on demand, to send the required traffic.

2.4.2.3 In the ground segment, the Linkway 2100 modem will support the PVCs required for voice communications with the Bogota and Guayaquil control centres and the REDDIG management and operations centre.

2.4.3 **Use of the currently installed Memotec CX-960e equipment**

2.4.3.1 In accordance with the information provided by COCESNA, cf. *Appendix B*, there are four slots available in the Memotec equipment for the installation of additional cards.

2.4.3.2 Slot # 3 will have installed one (1) V.35H card to be connected to the Linkway 2100 modem ground interface, to establish PVCs with the required destinations.

2.4.3.3 Slot # 6 will have installed two (2) voice channels with FXS interface for ATS operacional communications.

2.4.3.4 Slot # 5 will have installed one (1) voice channel with FXS interface for administrative/maintenance communications.

2.4.4 **Simultaneous operation of two (2) Linkway 2100 modem**

2.4.4.1 With the aim that the two Linkway 2100 modem (one in MEVA II and the other in REDDIG) simultaneously operate with an RF chain, and in the event there is unavailability of the AST4100 module in the node, two (2) L band combiners/dividers will be provided, one to combine the TX exits of the two Linkway 2100 modem towards the BUC/transmitter, and the other to divide the signal from the LNB towards the RX entries from the two Linkway 2100 modems.

2.4.5 **Performance of the loss of call probability**

2.4.5.1 *Premise*

Two (2) free channels are required to be always available for the 0.05 (5%) call loss probability at the COCESNA/REDDIG node ATS speech channels traffic flow.

2.4.5.2 *Considering*

a) That the network's peak hour traffic flow is estimated in 13.333 Erlangs;

b) That the network has 82 channels (traffic bursts) of 16 Kbps; and

c) That from the Traffic Flow and Loss Probability Table, *Appendix E*, it can be seen that 18 channels are required to support a 13.333 Erlangs traffic flow with a 0.05 (5%) call loss probability.

2.4.5.3 *Therefore*

The network will support at all times the two (2) additional channels in the node, under peak hour condition and with a 0.05 (%5) less or equal call loss probability.

2.5 Services

2.5.1 Implementation services

The COCESNA/REDDIG node implementation programme will comprise of the carrying out of the services until the COCESNA/REDDIG node activation, thenceforth automatically and transparently passing over to the operational service.

The implementation programme's schedule of activities will be presented 15 working days after the proposal's acceptance date.

2.5.1.1 *Equipment provision*

(1) One Linkway 2100 modem with AC feed source
(1) One ground serial interface with frame relay protocol
(1) One V.35 cable
(1) One V.35H Memotec card
(2) Two DAV Memotec cards
(3) Three FXS interfaces
(2) Two L band combiners/dividers
(1) One lot of coaxial cable, connectors and adapters

Optional: Recommended spare to improve node availability:

(1) One Linkway 2100 modem with AC feed source
(1) One ground serial interface with frame relay protocol

2.5.1.2 *Site survey*

Prior to the installation, a site survey will be carried out to complete the details necessary for the activation and operation of the COCESNA/REDDIG node.

In the event necessary and upon completion of this activity, the present technical-economical proposal could be reformulated.

2.5.1.3 *Equipment installation*

The installation of the equipment listed in paragraph 2.5.1.1 will be carried out through the implementation programme, in coordination with COCESNA and the MEVA II service provider, with the aim of reducing service interruption to a minimum.

2.5.1.4 *Satellite line up*

Satellite access tests and Linkway 2100 modem line up will be carried out, together with the current RF chain, to obtain the satellite downlink nominal power REDDIG has hired.

2.5.2 **Operation services**

REDDIG administration will provide the COCESNA/REDDIG node, 24H x 365D, the following services and facilities during the whole period of the contract. It is important to mention that the services and facilities which the COCENSA/REDDIG node will count with are the same as those currently being received by all REDDIG member States.

2.5.2.1 *Configuration*

a) COCESNA/REDDIG node configuration on the basis of REDDIG NCC data.

b) Memotec CX-960e equipment configuration with the proper features for the interconnection. ***To this end, either MEVA II service provider or COCESNA must provide the REDDIG administration with the Memotec CX-960e current configuration archive (.cxt).***

c) Configuration of the Guayaquil, Bogota, Manaus and Ezeiza nodes' Memotec CX-950 equipment with the proper features for the interconnection, and for administrative/maintenance purposes.

2.5.2.2 *End to end tests and COCESNA/REDDIG node activation*

In this final stage, simultaneous end to end tests will be carried out to the ATS voice channels, as to the administrative/maintenance voice channel. Upon satisfactory completion of the aforementioned, the COCESNA/REDDIG node will be declared activated, automatically passing to a nominal and continuous status of operation within REDDIG.

2.5.2.3 *Network access and satellite segment use*

REDDIG has three carriers, two of 1.25Msps and one of 0.625Msps, to process the traffic required by all nodes in the network. The COCESNA/REDDIG node will access, upon demand, any of the mentioned carriers.

2.5.2.4 *Network management and operation*

REDDIG has two NCCs (Network Control Center), one in Manaus, Brazil and the other in Ezeiza, Argentina, working only on NCC at a time. Each NCC has local redundancy, that is to say one operates on line and the other, on hot standby.

In addition, the network has MRT (Main Reference Terminal) geographical redundancy, one in Ezeiza and an AMRT (Alternate Main Reference Terminal) in Manaus, Brazil.

All this guarantees the continuous management and operation of the network for the provision of services to all its users.

It is important to mention that both NCCs use continuous uninterrupted power system (UPS), backed by automatic actioning redundant generators (1+1) in the event of outage of commercial power.

All this guarantees the network's continuous management and operation for the provision of services to users.

The REDDIG management centre will provide the node, on the basis of information available at the NCC, with band width use (outgoing traffic) monthly reports, availability (%) and performance (BER). In addition, in the event that failures occur in the node, they will be reported to the node's technical representative, through the application of the procedure established on failure follow-ups.

2.5.2.5 *Operational support*

REDDIG administration has a centre of operations located in Manaus, Brazil, which provides operational maintenance support to the REDDIG nodes, 24H x 365D.

This support includes, among other main activities, to preventively report the nodes of any anomaly detected by the NCC, receive calls from other nodes, carry out troubleshooting procedures, operational trials, coordinations and any tests necessary with the rest of the counterpart nodes, with the objective of keeping operational the node requiring the support.

Operational support has two levels to effectively attend to the nodes:

- The Operations Centre's operator; and
- The REDDIG administrator.

The above referred operational support contact numbers will be duly provided.

It is worth to mention that the REDDIG administrator also provides coordinate logistical support to the nodes' administrative representatives on activities regarding the repair/substitution of the node equipment, as applicable, by indicating the corresponding necessary procedures.

Also, if required, the REDDIG administrator could activate the alternate centre of operations in Ezeiza, Argentina.

3. ECONOMICAL PROPOSAL

3.1 Implementation services

3.1.1 The prices presented are those provided by the companies manufacturing the equipment and cards necessary for MEVA II / REDDIG interconnection. To these, a 10% percent was added, corresponding to the Administrative Overhead Service Charge (AOSC) of the ICAO Technical Cooperation Bureau Purchasing Section.

3.1.2 Equipment provision

(1) One Linkway 2100 modem with AC feeding source	US$13,084.50
(1) One ground serial interface with frame relay protocol	
(1) One V.35 cable	US$ 125.00
(1) One V.35H Memotec card	US$ 734.14
(2) Two DAV Memotec cards	US$ 2,789.76
(3) Three FXS interfaces	US$ 1,468.30
(2) Two L band combiners/dividers	US$ 550.00
(1) One Lot of coaxial cable, connectors and adapters	US$ 1,650.00

Once only Value US$ = 20,401.70

3.1.3 Optional: Spare parts recommendation

(1) One Linkway 2100 modem with AC feeding source
(1) One ground serial interface with frame relay protocol

Once only Value US$ = 13,084.50

3.1.4 Complementary services

- site survey	US$ 2,486.00
- equipment installation satellite line up and link tests	US$ 4,023.80

Once only Value US$ = 6,509.80

Note: The proposal presents an overall implementation scheme by purchasing the equipment through RLA/03/901 project. COCESNA, if it so considers, can opt by hiring these services separately from this proposal; nevertheless, the satellite line-up must be implemented in coordination with REDDIG administration, as well as any other operations necessary for the start up.

3.2 Operational services

3.2.1 Prices presented for recurrent services are obtained on the basis of administrative costs necessary to maintain REDDIG, as well as the space segment cost. A 10%, corresponding to AOSC, has also been added to these prices.

3.2.2	**Configuration, end to end tests and node activation**		
	Configuration		US$ 4,340.00
	Trials and Activation		US$ 2,810.00
	Once only	Value US$ = 7,150.00	
3.2.3	**Recurrent services**		
	a) Network access and satellite segment use Monthly	Value US$ = 389.40	
	b) Network management and operation Monthly	Value US$ = 924.00	
	c) Operational support Monthly	Value US$ = 286.00	
3.2.4	**Total monthly recurrence**	Value US$ 1,599.40	
3.2.5	**Total annual recurrence**	Value US$ 19,192.80	

NOTE

½ Additional Voice Channel	Monthly value	US$	130.00
½ Additional AFTN Channel	Monthly value	US$	270.00

4. TERMS AND CONDITIONS

4.1 Currency

4.1.1 The prices are expressed in United States Dollars.

4.2 Manner of payment

a) Implementation services

100% of the value of the services – one time payment
15 days after the proposal's acceptance date

b) Operational services

b.1) 100% of the value of the services – one time payment
15 days after the proposal's acceptance date

b.2) 100% of the recurrent services total annual value
In advance to the activation of the COCESNA/REDDIG node and following the procedure adopted by the REDDIG administration under RLA/03/901 regional technical cooperation project.

Note: As REDDIG is operated and maintained under RLA/03/901 regional project, ICAO requires a 100% disbursement to cover services provision costs.

4.3 Operational services start up

4.3.1 This will be stipulated in the implementation programme.

4.4 Equipment guarantee

4.4.1 The equipment guarantee is of twelve (12) months against manufacturing defects. In the event any failure is diagnosed within this period in the equipment, the damaged equipment, or part thereof, will be sent to the respective manufacturing company for its repair and return to the node.

4.4.2 This proposal does not take into consideration the immediate replacement of any damaged equipment, or part thereof, during the period of its repair.

4.5 Responsibilities of COCESNA

a) COCESNA will be responsible for and assume all expenses due to the internment of the equipment in Honduras, as well as of its transfer to the node site.

b) The programming or configuration of the COCESNA central or voice switcher for the new voice channels subject to interconnection.

c) Provide the necessary support to REDDIG administration personnel, or to whomever REDDIG designates, for the site survey and installation.

d) During the guarantee period, COCESNA will only take care of exportation and transport costs of the damaged equipment, or part, to the manufacturing company.

e) Out of the guarantee period, COCESNA will cover all exportation, repair and re-importation costs, including transportation, of the damaged equipment, or part.

ATTACHMENT 1

PAS-1R-4C QPSK 1750kHz TEGUCIGALP(3.8m) to BOGOTA(3.7m)

SATELLITE DATA	Satellite : PAS-1R	Location: 45.0W		
	Uplink Beam: US_LAM_CVUP	Dnlink Beam: US_LAM_CVDN		
	Uplink POL: V, Dnlink POL: V, EIRP, beam center: 43.36 dBW			
	G/T:-.1 dB/K, SFD:-89.0 dBW/m2	Dnlink EIRP: 43.1 dBW		
TRANSPONDER DATA	Trans Bandwidth :36.0 MHz	Trans Type: LTWTA_C		
	Uplink Frequency:6.000 GHz	Dnlink Freq: 3.775 GHz		
	IBO (Nominal) : 5.0 dB	OBO (Nominal): 3.5 dB		
CARRIER DATA	Type: Linkway 2100, Info Rate: 1144 kbps, Mod: QPSK, 1/2x21			
	BWo: 1500kHz, BWa: 1750kHz, C/N: 4.3dB, C/N_thresh: 4.3dB			
	LINK BUDGET		CLR SKY	UP FADE	DN FADE
UPLINK PERFORMANCE	Earth Station EIRP	(dBW)	51.8	51.8	51.8
	- Uplink Path Loss, clear sky	(dB)	-199.6	-199.6	-199.6
	- Uplink Rain Attenuation	(dB)	0.0	-2.5	0.0
	+ Satellite G/T	(dB/K)	-.1	-.1	-.1
	- Boltzman's Constant	(dBW/K-Hz)	228.6	228.6	228.6
	- Carrier Noise Bandwidth	(dB-Hz)	-61.8	-61.8	-61.8
	C/N Uplink	(dB)	19.0	16.5	19.0
DOWNLINK PERFORMANCE	Satellite Saturation EIRP	(dBW)	43.1	43.1	43.1
	- Carrier Output Backoff	(dB)	-20.2	-22.7	-20.2
	Downlink EIRP per carrier	(dBW)	22.9	20.4	22.9
	- Earth Station Pointing Error	(dB)	-.5	-.5	-.5
	- Downlink Path Loss, clear sky	(dB)	-195.3	-195.3	-195.3
	- Downlink Rain Attenuation	(dB)	0.0	0.0	-3.2
	+ Earth Station G/T	(dB/K)	22.0	22.0	17.4
	- Boltzman's Constant	(dBW/K-Hz)	228.6	228.6	228.6
	- Carrier Noise Bandwidth	(dB-Hz)	-61.8	-61.8	-61.8
	C/N Dnlink	(dB)	16.0	13.5	8.1
COMPOSITE PERFORMANCE	C/N Uplink	(dB)	19.0	16.5	19.0
	C/N Dnlink	(dB)	16.0	13.5	8.1
	C/I Intermod	(dB)	14.3	11.9	14.3
	C/I Uplink Co-channel	(dB)	23.4	20.9	23.4
	C/I Dnlink Co-Channel	(dB)	23.4	20.9	23.4
	C/I Uplink Adj. Sat. (PAS3)	(dB)	16.7	14.2	16.7
	C/I Dnlink Adj. Sat. (PAS3)	(dB)	16.8	14.3	16.8
	C/I Uplink Adj. Sat. (THRDS-6)	(dB)	16.7	14.2	16.7
	C/I Dnlink Adj. Sat. (THRDS-6)	(dB)	17.5	14.9	17.5
	C/(N+I) COMPOSITE	(dB)	7.8	5.3	5.3
	- Required System Margin	(dB)	-1.0	-1.0	-1.0
	Net C/(N+I) COMPOSITE	(dB)	6.8	4.3	4.3
	- Minimum Required C/N	(dB)	-4.3	-4.3	-4.3
	Excess Link Margin	(dB)	2.5	0.0	0.0
TRANSPONDER UTILIZATION	% BW/CARR: 4.86, % PWR/CARR: 2.14, Max No. Carriers: 20.6				
	Downlink EIRP per carrier toward beam center: 23.2 dBW				
TRANSMIT EARTH STATION	Loc: HONDURAS__TEGUCIGA ID:1381	AZ: 105.0 Elev: 39.2			
	LAT: 14.1N LON: 87.2W ALT: 1370m	RainRate: 76.1mm/hr			
	Carrier Power: 4.0 watts				

```
|RECEIVE     |Loc: COLOMBIA__BOGOTA   ID: AZ: 97.9 Elev: 54.6             |
|EARTH STA.  |LAT: 4.6N  LON: 75.1W  ALT: 1830m  RainRate: 79.2mm/hr      |
|------------------------------------------------------------------------|
|DENSITY     |Uplink Pwr Den: -55.7 dBW/Hz, Dnlink EIRP Den: -38.6 dBW/Hz |
|INFORMATION |Max Dnlink PFD: -164.9 dB(W/m2/4kHz) @ Beam Center          |
|------------------------------------------------------------------------|
|AVAILABILITY|Uplink: 99.998%,  Dnlink: 99.998%,  Composite Link: 99.995% |
|------------------------------------------------------------------------|
|LOSS IN C/(N+I) DUE TO ADJ SAT INTF: PAS3 = 1.3dB, THRDS-6 = 1.2dB      |
--------------------------------------------------------------------------
SATOPT5_PAS (Version 5.74)
PanAmSat, Customer Support Engineering.



PAS-1R-4C QPSK 1750kHz TEGUCIGALP(3.8m) to BOGOTA(3.7m)
[ Input Data ]

--------------------------------- SATELLITE ---------------------------------

Satellite Name  : PAS-1R              Location   (deg): 45.0W
Uplink Beam     : US_LAM_CVUP         Dnlink Beam     : US_LAM_CVDN
Trans. BW  (MHz): 36.0 MHz            Trans. Type     : LTWTA_C
Uplink Pol.     : V                   Dnlink Pol.     : V
Uplink Chan.    : 3C                  Dnlink Chan.    : 4C
Uplink Frequency     (GHz): 6.000     Dnlink Frequency     (GHz): 3.775
G/T, beam center    (dB/K): 1.29      EIRP, beam center    (dBW): 43.36
G/T, beam edge      (dB/K): -10.0     EIRP, beam edge      (dBW): 34.0
G/T, toward Tx ES   (dB/K): -.1       EIRP, toward Rx ES   (dBW): 43.1
SFD, beam edge    (dBW/m2): -79.1
SFD, toward Tx ES (dBW/m2): -89.0

--------------------------- OPERATING CONDITIONS ---------------------------

Attenuator Setting (dB): 8.0          Nominal Uplink Co-Chan C/I (dB): 27
Input Backoff      (dB): 5.0          Nominal Dnlink Co-Chan C/I (dB): 27
Output Backoff     (dB): *            Minimum Uplink Rain Margin (dB):  0.5*
(C/Im) - Nominal   (dB): *            Actual  Uplink Rain Margin (dB):  2.5
Min. System Margin (dB): 1.0          Uplink Power Control Margin(dB):  .0
Max No Carriers / Trans: *            Minimum Dnlink Rain Margin (dB):  0.5*
Required Link Availability: 99.9      Actual  Dnlink Rain Margin (dB):  7.8
                                      Dnlink Pointing Error      (dB):  0.5

-- ADJACENT SATELLITE INTERFERENCE ----- Sat. No. 1 -------- Sat. No. 2 -----

Interfering Satellite Name          :      PAS3               THRDS-6
Interfering Satellite Location  (deg):     43W                47W
Uplink Interference    (dB or dBW/Hz):     -46                -46
Uplink Polarization Advantage    (dB):     0                  0
Downlink Interference  (dB or dBW/Hz):     -37.6              -35.2
Downlink Polarization Advantage  (dB):     0                  0
Rx E/S Topocentric Angle        (deg):     2.16               2.17
Rx E/S Pointing Error           (deg):     -0.30              0.30
Rx E/S Off-Axis Angle           (deg):     1.86               2.47
Rx E/S Adj. Sat. Discrimination  (dB):     18.0               21.1

--------------------------- CARRIER PARAMETERS ---------------------------


Modem Type     : Linkway 2100         C/N         (operating, dB): 4.3
Modulation     : QPSK                 Eb/No       (operating, dB): 5.5
Code Rate      : 1/2x216/236-V        C/N         (threshold, dB): 4.3
Info Rate (kbps): 1144                Eb/No       (threshold, dB): 5.5
Occupied Bandwidth  (kHz): 1500
Allocated Bandwidth (kHz): 1750
```

```
------ Transmit Earth Station ------    ------- Receive Earth Station -------

Location: HONDURAS__TEGUCIGALP          Location: COLOMBIA__BOGOTA
Latitude       (deg): 14.1N             Latitude       (deg): 4.6N
Longitude      (deg): 87.2W             Longitude      (deg): 75.1W
Rain Rate    (mm/hr): 76.1              Rain Rate    (mm/hr): 79.2
E/S Type or Model No: 1381              E/S Type or Model No:
E/S Manufacturer    : PRODELIN          E/S Manufacturer    : STANDARD
E/S Diam.        (m): 3.8               E/S Diam.        (m): 3.7
E/S Freq  (nom, GHz): 6.175             E/S Freq  (nom, GHz): 3.95
E/S Tx Gain    (dBi): 46.0              E/S Gain  (nom, dBi): 41.2
ULPC Margin     (dB): .0                E/S Feed Loss   (dB): 0.20
                                        E/S Ant. Temp(deg K): 25
                                        E/S LNA Temp (deg K): 35
                                        E/S G/T  (nom, dB/K): *

 SATOPT5 (Version 5.74)  (C) 2004 TEL/COM Sciences, Inc.  All Rights Reserved.
 22-Aug-07 16:19    INPUT FILE: C:\SATOPT5_PAS74\Link Budgets\ICAO Lima - Manaus\PAS-1R-4C
TEGUCIGALP(3_8m) to BOGOTA(3_7m).DTA
 PanAmSat, Customer Support Engineering.
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ATTACHMENT 2

PAS-1R-4C QPSK 1750kHz TEGUCIGALP(3.8m) to GEORGE_T(3.8m)

SATELLITE DATA	Satellite : PAS-1R	Location: 45.0W		
	Uplink Beam: US_LAM_CVUP	Dnlink Beam: US_LAM_CVDN		
	Uplink POL: V, Dnlink POL: V, EIRP, beam center: 43.36 dBW			
	G/T:-.1 dB/K, SFD:-89.0 dBW/m2 Dnlink EIRP: 41.5 dBW			
TRANSPONDER DATA	Trans Bandwidth :36.0 MHz	Trans Type: LTWTA_C		
	Uplink Frequency:6.000 GHz	Dnlink Freq: 3.775 GHz		
	IBO (Nominal) : 5.0 dB	OBO (Nominal): 3.5 dB		
CARRIER DATA	Type: Linkway 2100, Info Rate: 1144 kbps, Mod: QPSK, 1/2x21			
	BWo: 1500kHz, BWa: 1750kHz, C/N: 4.3dB, C/N_thresh: 4.3dB			
	LINK BUDGET		CLR SKY	UP FADE	DN FADE
UPLINK PERFORMANCE	Earth Station EIRP	(dBW)	52.1	52.1	52.1
	- Uplink Path Loss, clear sky	(dB)	-199.6	-199.6	-199.6
	- Uplink Rain Attenuation	(dB)	0.0	-2.5	0.0
	+ Satellite G/T	(dB/K)	-.1	-.1	-.1
	- Boltzman's Constant	(dBW/K-Hz)	228.6	228.6	228.6
	- Carrier Noise Bandwidth	(dB-Hz)	-61.8	-61.8	-61.8
	C/N Uplink	(dB)	19.2	16.7	19.2
DOWNLINK PERFORMANCE	Satellite Saturation EIRP	(dBW)	41.5	41.5	41.5
	- Carrier Output Backoff	(dB)	-20.0	-22.5	-20.0
	Downlink EIRP per carrier	(dBW)	21.5	19.0	21.5
	- Earth Station Pointing Error	(dB)	-.5	-.5	-.5
	- Downlink Path Loss, clear sky	(dB)	-195.5	-195.5	-195.5
	- Downlink Rain Attenuation	(dB)	0.0	0.0	-3.0
	+ Earth Station G/T	(dB/K)	24.0	24.0	18.8
	- Boltzman's Constant	(dBW/K-Hz)	228.6	228.6	228.6
	- Carrier Noise Bandwidth	(dB-Hz)	-61.8	-61.8	-61.8
	C/N Dnlink	(dB)	16.4	13.8	8.2
COMPOSITE PERFORMANCE	C/N Uplink	(dB)	19.2	16.7	19.2
	C/N Dnlink	(dB)	16.4	13.8	8.2
	C/I Intermod	(dB)	14.6	12.1	14.6
	C/I Uplink Co-channel	(dB)	23.7	21.2	23.7
	C/I Dnlink Co-Channel	(dB)	23.7	21.2	23.7
	C/I Uplink Adj. Sat. (PAS3)	(dB)	16.9	14.4	16.9
	C/I Dnlink Adj. Sat. (PAS3)	(dB)	15.8	13.3	15.8
	C/I Uplink Adj. Sat. (THRDS-6)	(dB)	16.9	14.4	16.9
	C/I Dnlink Adj. Sat. (THRDS-6)	(dB)	16.8	14.3	16.8
	C/(N+I) COMPOSITE	(dB)	7.8	5.3	5.3
	- Required System Margin	(dB)	-1.0	-1.0	-1.0
	Net C/(N+I) COMPOSITE	(dB)	6.8	4.3	4.3
	- Minimum Required C/N	(dB)	-4.3	-4.3	-4.3
	Excess Link Margin	(dB)	2.5	0.0	0.0
TRANSPONDER UTILIZATION	% BW/CARR: 4.86, % PWR/CARR: 2.26, Max No. Carriers: 20.6				
	Downlink EIRP per carrier toward beam center: 23.4 dBW				
TRANSMIT EARTH STATION	Loc: HONDURAS__TEGUCIGA ID:1381	AZ: 105.0 Elev: 39.2			
	LAT: 14.1N LON: 87.2W ALT: 1370m	RainRate: 76.1mm/hr			
	Carrier Power: 4.3 watts				

```
|RECEIVE     |Loc: CAYMAN_ISLANDS__GE ID:1381        AZ: 114.1 Elev: 43.1 |
|EARTH STA.  |LAT: 19.3N  LON: 81.4W  ALT: 0.0m  RainRate: 106.mm/hr       |
|------------------------------------------------------------------------|
|DENSITY     |Uplink Pwr Den: -55.4 dBW/Hz, Dnlink EIRP Den: -38.4 dBW/Hz |
|INFORMATION |Max Dnlink PFD: -164.8 dB(W/m2/4kHz) @ Beam Center          |
|------------------------------------------------------------------------|
|AVAILABILITY|Uplink: 99.998%,  Dnlink: 99.998%,  Composite Link: 99.995% |
|------------------------------------------------------------------------|
|LOSS IN C/(N+I) DUE TO ADJ SAT INTF: PAS3 = 1.4dB, THRDS-6 = 1.2dB      |
--------------------------------------------------------------------------
SATOPT5_PAS (Version 5.74)
PanAmSat, Customer Support Engineering.


PAS-1R-4C QPSK 1750kHz TEGUCIGALP(3.8m) to GEORGE_T(3.8m)
[ Input Data ]

--------------------------------- SATELLITE ---------------------------------

Satellite Name  : PAS-1R              Location   (deg): 45.0W
Uplink Beam     : US_LAM_CVUP         Dnlink Beam     : US_LAM_CVDN
Trans. BW  (MHz): 36.0 MHz            Trans. Type     : LTWTA_C
Uplink Pol.     : V                   Dnlink Pol.     : V
Uplink Chan.    : 3C                  Dnlink Chan.    : 4C
Uplink Frequency     (GHz): 6.000     Dnlink Frequency     (GHz): 3.775
G/T, beam center    (dB/K): 1.29      EIRP, beam center    (dBW): 43.36
G/T, beam edge      (dB/K): -10.0     EIRP, beam edge      (dBW): 34.0
G/T, toward Tx ES   (dB/K): -.1       EIRP, toward Rx ES   (dBW): 41.5
SFD, beam edge    (dBW/m2): -79.1
SFD, toward Tx ES (dBW/m2): -89.0

---------------------------- OPERATING CONDITIONS ----------------------------

Attenuator Setting (dB): 8.0          Nominal Uplink Co-Chan C/I (dB): 27
Input Backoff      (dB): 5.0          Nominal Dnlink Co-Chan C/I (dB): 27
Output Backoff     (dB): *            Minimum Uplink Rain Margin (dB):  0.5*
(C/Im) - Nominal   (dB): *            Actual  Uplink Rain Margin (dB):  2.5
Min. System Margin (dB): 1.0          Uplink Power Control Margin(dB):  .0
Max No Carriers / Trans: *            Minimum Dnlink Rain Margin (dB):  0.5*
Required Link Availability: 99.9      Actual  Dnlink Rain Margin (dB):  8.2
                                      Dnlink Pointing Error      (dB):  0.5

-- ADJACENT SATELLITE INTERFERENCE ----- Sat. No. 1 -------- Sat. No. 2 -----

Interfering Satellite Name          :      PAS3               THRDS-6
Interfering Satellite Location  (deg):     43W                47W
Uplink Interference    (dB or dBW/Hz):     -46                -46
Uplink Polarization Advantage    (dB):     0                  0
Downlink Interference  (dB or dBW/Hz):     -37.6              -35.2
Downlink Polarization Advantage  (dB):     0                  0
Rx E/S Topocentric Angle        (deg):     2.12               2.13
Rx E/S Pointing Error           (deg):     -0.30              0.30
Rx E/S Off-Axis Angle           (deg):     1.82               2.43
Rx E/S Adj. Sat. Discrimination  (dB):     18.5               21.9

---------------------------- CARRIER PARAMETERS ----------------------------

Modem Type     : Linkway 2100         C/N         (operating, dB): 4.3
Modulation     : QPSK                 Eb/No       (operating, dB): 5.5
Code Rate      : 1/2x216/236-V        C/N         (threshold, dB): 4.3
Info Rate (kbps): 1144                Eb/No       (threshold, dB): 5.5
Occupied Bandwidth  (kHz): 1500
Allocated Bandwidth (kHz): 1750

------ Transmit Earth Station ------    ------- Receive Earth Station -------
```

```
 Location: HONDURAS__TEGUCIGALP        Location: CAYMAN_ISLANDS__GEORGE_T
 Latitude       (deg): 14.1N           Latitude       (deg): 19.3N
 Longitude      (deg): 87.2W           Longitude      (deg): 81.4W
 Rain Rate    (mm/hr): 76.1            Rain Rate    (mm/hr): 106.
 E/S Type or Model No: 1381            E/S Type or Model No: 1381
 E/S Manufacturer    : PRODELIN        E/S Manufacturer    : PRODELIN
 E/S Diam.        (m): 3.8             E/S Diam.        (m): 3.8
 E/S Freq  (nom, GHz): 6.175           E/S Freq  (nom, GHz): 3.95
 E/S Tx Gain    (dBi): 46.0            E/S Gain  (nom, dBi): 42.1
 ULPC Margin     (dB): .0              E/S Feed Loss   (dB): 0.20
                                       E/S Ant. Temp(deg K): 25
                                       E/S LNA Temp (deg K): 20
                                       E/S G/T  (nom, dB/K): *

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 22-Aug-07 16:14    INPUT FILE: C:\SATOPT5_PAS74\Link Budgets\ICAO Lima - Manaus\PAS-1R-4C
TEGUCIGALP(3_8m) to GEORGE_T(3_8m).DTA
 PanAmSat, Customer Support Engineering.
```

ATTACHMENT 3

PAS-1R-4C QPSK 1750kHz TEGUCIGALP(3.8m) to Guayaquil(3.7m)

SATELLITE DATA	Satellite : PAS-1R		Location: 45.0W	
	Uplink Beam: US_LAM_CVUP		Dnlink Beam: US_LAM_CVDN	
	Uplink POL: V, Dnlink POL: V, EIRP, beam center: 43.36 dBW			
	G/T:-.1 dB/K, SFD:-89.0 dBW/m2		Dnlink EIRP: 42.0 dBW	
TRANSPONDER DATA	Trans Bandwidth :36.0 MHz		Trans Type: LTWTA_C	
	Uplink Frequency:6.000 GHz		Dnlink Freq: 3.775 GHz	
	IBO (Nominal) : 5.0 dB		OBO (Nominal): 3.5 dB	
CARRIER DATA	Type: Linkway 2100, Info Rate: 1144 kbps, Mod: QPSK, 1/2x21			
	BWo: 1500kHz, BWa: 1750kHz, C/N: 4.3dB, C/N_thresh: 4.3dB			
	LINK BUDGET		CLR SKY	UP FADE	DN FADE
UPLINK PERFORMANCE	Earth Station EIRP	(dBW)	52.3	52.3	52.3
	- Uplink Path Loss, clear sky	(dB)	-199.6	-199.6	-199.6
	- Uplink Rain Attenuation	(dB)	0.0	-2.5	0.0
	+ Satellite G/T	(dB/K)	-.1	-.1	-.1
	- Boltzman's Constant	(dBW/K-Hz)	228.6	228.6	228.6
	- Carrier Noise Bandwidth	(dB-Hz)	-61.8	-61.8	-61.8
	C/N Uplink	(dB)	19.5	17.0	19.5
DOWNLINK PERFORMANCE	Satellite Saturation EIRP	(dBW)	42.0	42.0	42.0
	- Carrier Output Backoff	(dB)	-19.7	-22.2	-19.7
	Downlink EIRP per carrier	(dBW)	22.3	19.8	22.3
	- Earth Station Pointing Error	(dB)	-.5	-.5	-.5
	- Downlink Path Loss, clear sky	(dB)	-195.4	-195.4	-195.4
	- Downlink Rain Attenuation	(dB)	0.0	0.0	-2.9
	+ Earth Station G/T	(dB/K)	22.0	22.0	17.6
	- Boltzman's Constant	(dBW/K-Hz)	228.6	228.6	228.6
	- Carrier Noise Bandwidth	(dB-Hz)	-61.8	-61.8	-61.8
	C/N Dnlink	(dB)	15.3	12.8	8.0
	C/N Uplink	(dB)	19.5	17.0	19.5
	C/N Dnlink	(dB)	15.3	12.8	8.0
	C/I Intermod	(dB)	14.8	12.4	14.8
	C/I Uplink Co-channel	(dB)	23.9	21.4	23.9
	C/I Dnlink Co-Channel	(dB)	23.9	21.4	23.9
	C/I Uplink Adj. Sat. (PAS3)	(dB)	17.2	14.7	17.2
	C/I Dnlink Adj. Sat. (PAS3)	(dB)	16.0	13.5	16.0
	C/I Uplink Adj. Sat. (THRDS-6)	(dB)	17.2	14.7	17.2
	C/I Dnlink Adj. Sat. (THRDS-6)	(dB)	16.8	14.3	16.8
COMPOSITE PERFORMANCE	C/(N+I) COMPOSITE	(dB)	7.8	5.3	5.3
	- Required System Margin	(dB)	-1.0	-1.0	-1.0
	Net C/(N+I) COMPOSITE	(dB)	6.8	4.3	4.3
	- Minimum Required C/N	(dB)	-4.3	-4.3	-4.3
	Excess Link Margin	(dB)	2.5	0.0	0.0
TRANSPONDER UTILIZATION	% BW/CARR: 4.86, % PWR/CARR: 2.4, Max No. Carriers: 20.6				
	Downlink EIRP per carrier toward beam center: 23.7 dBW				
TRANSMIT EARTH STATION	Loc: HONDURAS__TEGUCIGA ID:1381		AZ: 105.0 Elev: 39.2		
	LAT: 14.1N LON: 87.2W ALT: 1370m		RainRate: 76.1mm/hr		
	Carrier Power: 4.5 watts				

```
|RECEIVE     |Loc: ECUADOR__Guayaquil ID: AZ: 86.9 Elev: 49.4             |
|EARTH STA.  |LAT: 2.2S  LON: 79.9W  ALT: 30.0m  RainRate: 70.2mm/hr      |
|------------------------------------------------------------------------|
|DENSITY     |Uplink Pwr Den: -55.2 dBW/Hz, Dnlink EIRP Den: -38.1 dBW/Hz |
|INFORMATION |Max Dnlink PFD: -164.4 dB(W/m2/4kHz) @ Beam Center          |
|------------------------------------------------------------------------|
|AVAILABILITY|Uplink: 99.998%,  Dnlink: 99.998%,  Composite Link: 99.995% |
|------------------------------------------------------------------------|
|LOSS IN C/(N+I) DUE TO ADJ SAT INTF: PAS3 = 1.3dB, THRDS-6 = 1.2dB      |
--------------------------------------------------------------------------
SATOPT5_PAS (Version 5.74)
PanAmSat, Customer Support Engineering.



PAS-1R-4C QPSK 1750kHz TEGUCIGALP(3.8m) to Guayaquil(3.7m)
[ Input Data ]

--------------------------------- SATELLITE ---------------------------------

Satellite Name  : PAS-1R              Location   (deg): 45.0W
Uplink Beam     : US_LAM_CVUP         Dnlink Beam     : US_LAM_CVDN
Trans. BW  (MHz): 36.0 MHz            Trans. Type     : LTWTA_C
Uplink Pol.     : V                   Dnlink Pol.     : V
Uplink Chan.    : 3C                  Dnlink Chan.    : 4C
Uplink Frequency     (GHz): 6.000     Dnlink Frequency     (GHz): 3.775
G/T, beam center    (dB/K): 1.29      EIRP, beam center    (dBW): 43.36
G/T, beam edge      (dB/K): -10.0     EIRP, beam edge      (dBW): 34.0
G/T, toward Tx ES   (dB/K): -.1       EIRP, toward Rx ES   (dBW): 42.0
SFD, beam edge    (dBW/m2): -79.1
SFD, toward Tx ES (dBW/m2): -89.0

--------------------------- OPERATING CONDITIONS ---------------------------

Attenuator Setting (dB): 8.0          Nominal Uplink Co-Chan C/I (dB): 27
Input Backoff      (dB): 5.0          Nominal Dnlink Co-Chan C/I (dB): 27
Output Backoff     (dB): *            Minimum Uplink Rain Margin (dB):  0.5*
(C/Im) - Nominal   (dB): *            Actual  Uplink Rain Margin (dB):  2.5
Min. System Margin (dB): 1.0          Uplink Power Control Margin(dB):  .0
Max No Carriers / Trans: *            Minimum Dnlink Rain Margin (dB):  0.5*
Required Link Availability: 99.9      Actual  Dnlink Rain Margin (dB):  7.3
                                      Dnlink Pointing Error      (dB):  0.5

-- ADJACENT SATELLITE INTERFERENCE ----- Sat. No. 1 -------- Sat. No. 2 -----

Interfering Satellite Name          :      PAS3               THRDS-6
Interfering Satellite Location  (deg):     43W                47W
Uplink Interference    (dB or dBW/Hz):     -46                -46
Uplink Polarization Advantage    (dB):     0                  0
Downlink Interference  (dB or dBW/Hz):     -37.6              -35.2
Downlink Polarization Advantage  (dB):     0                  0
Rx E/S Topocentric Angle        (deg):     2.14               2.15
Rx E/S Pointing Error           (deg):     -0.30              0.30
Rx E/S Off-Axis Angle           (deg):     1.84               2.45
Rx E/S Adj. Sat. Discrimination  (dB):     17.9               21.0

--------------------------- CARRIER PARAMETERS ---------------------------

Modem Type     : Linkway 2100         C/N         (operating, dB): 4.3
Modulation     : QPSK                 Eb/No       (operating, dB): 5.5
Code Rate      : 1/2x216/236-V        C/N         (threshold, dB): 4.3
Info Rate (kbps): 1144                Eb/No       (threshold, dB): 5.5
Occupied Bandwidth  (kHz): 1500
Allocated Bandwidth (kHz): 1750

------ Transmit Earth Station ------    ------- Receive Earth Station -------
```

```
 Location: HONDURAS__TEGUCIGALP        Location: ECUADOR__Guayaquil
 Latitude       (deg): 14.1N           Latitude       (deg): 2.2S
 Longitude      (deg): 87.2W           Longitude      (deg): 79.9W
 Rain Rate    (mm/hr): 76.1            Rain Rate    (mm/hr): 70.2
 E/S Type or Model No: 1381            E/S Type or Model No:
 E/S Manufacturer    : PRODELIN        E/S Manufacturer    : STANDARD
 E/S Diam.        (m): 3.8             E/S Diam.        (m): 3.7
 E/S Freq  (nom, GHz): 6.175           E/S Freq  (nom, GHz): 3.95
 E/S Tx Gain    (dBi): 46.0            E/S Gain  (nom, dBi): 41.2
 ULPC Margin     (dB): .0              E/S Feed Loss   (dB): 0.20
                                       E/S Ant. Temp(deg K): 25
                                       E/S LNA Temp (deg K): 35
                                       E/S G/T  (nom, dB/K): *

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 22-Aug-07 16:20    INPUT FILE: C:\SATOPT5_PAS74\Link Budgets\ICAO Lima - Manaus\PAS-1R-4C
TEGUCIGALP(3_8m) to Guayaquil(3_7m).DTA
 PanAmSat, Customer Support Engineering.
```

ATTACHMENT 4

PAS-1R-4C QPSK 1750kHz TEGUCIGALP(3.8m) to HAVANA(3.8m)

SATELLITE DATA	Satellite : PAS-1R	Location: 45.0W		
	Uplink Beam: US_LAM_CVUP	Dnlink Beam: US_LAM_CVDN		
	Uplink POL: V, Dnlink POL: V, EIRP, beam center: 43.36 dBW			
	G/T:-.1 dB/K, SFD:-89.0 dBW/m2 Dnlink EIRP: 40.8 dBW			
TRANSPONDER DATA	Trans Bandwidth :36.0 MHz	Trans Type: LTWTA_C		
	Uplink Frequency:6.000 GHz	Dnlink Freq: 3.775 GHz		
	IBO (Nominal) : 5.0 dB	OBO (Nominal): 3.5 dB		
CARRIER DATA	Type: Linkway 2100, Info Rate: 1144 kbps, Mod: QPSK, 1/2x21			
	BWo: 1500kHz, BWa: 1750kHz, C/N: 4.3dB, C/N_thresh: 4.3dB			
	LINK BUDGET		CLR SKY	UP FADE	DN FADE
UPLINK PERFORMANCE	Earth Station EIRP	(dBW)	52.4	52.4	52.4
	- Uplink Path Loss, clear sky	(dB)	-199.6	-199.6	-199.6
	- Uplink Rain Attenuation	(dB)	0.0	-2.5	0.0
	+ Satellite G/T	(dB/K)	-.1	-.1	-.1
	- Boltzman's Constant	(dBW/K-Hz)	228.6	228.6	228.6
	- Carrier Noise Bandwidth	(dB-Hz)	-61.8	-61.8	-61.8
	C/N Uplink	(dB)	19.6	17.1	19.6
DOWNLINK PERFORMANCE	Satellite Saturation EIRP	(dBW)	40.8	40.8	40.8
	- Carrier Output Backoff	(dB)	-19.6	-22.1	-19.6
	Downlink EIRP per carrier	(dBW)	21.2	18.7	21.2
	- Earth Station Pointing Error	(dB)	-.5	-.5	-.5
	- Downlink Path Loss, clear sky	(dB)	-195.5	-195.5	-195.5
	- Downlink Rain Attenuation	(dB)	0.0	0.0	-2.8
	+ Earth Station G/T	(dB/K)	24.0	24.0	18.9
	- Boltzman's Constant	(dBW/K-Hz)	228.6	228.6	228.6
	- Carrier Noise Bandwidth	(dB-Hz)	-61.8	-61.8	-61.8
	C/N Dnlink	(dB)	16.0	13.5	8.1
COMPOSITE PERFORMANCE	C/N Uplink	(dB)	19.6	17.1	19.6
	C/N Dnlink	(dB)	16.0	13.5	8.1
	C/I Intermod	(dB)	14.9	12.5	14.9
	C/I Uplink Co-channel	(dB)	24.0	21.5	24.0
	C/I Dnlink Co-Channel	(dB)	24.0	21.5	24.0
	C/I Uplink Adj. Sat. (PAS3)	(dB)	17.3	14.8	17.3
	C/I Dnlink Adj. Sat. (PAS3)	(dB)	15.3	12.8	15.3
	C/I Uplink Adj. Sat. (THRDS-6)	(dB)	17.3	14.8	17.3
	C/I Dnlink Adj. Sat. (THRDS-6)	(dB)	16.4	13.9	16.4
	C/(N+I) COMPOSITE	(dB)	7.8	5.3	5.3
	- Required System Margin	(dB)	-1.0	-1.0	-1.0
	Net C/(N+I) COMPOSITE	(dB)	6.8	4.3	4.3
	- Minimum Required C/N	(dB)	-4.3	-4.3	-4.3
	Excess Link Margin	(dB)	2.5	0.0	0.0
TRANSPONDER UTILIZATION	% BW/CARR: 4.86, % PWR/CARR: 2.46, Max No. Carriers: 20.6				
	Downlink EIRP per carrier toward beam center: 23.8 dBW				
TRANSMIT EARTH STATION	Loc: HONDURAS__TEGUCIGA ID:1381	AZ: 105.0 Elev: 39.2			
	LAT: 14.1N LON: 87.2W ALT: 1370m	RainRate: 76.1mm/hr			
	Carrier Power: 4.6 watts				

```
|RECEIVE     |Loc: CUBA__HAVANA       ID:1381        AZ: 117.2 Elev: 40.3 |
|EARTH STA.  |LAT: 23.1N  LON: 82.4W  ALT: 60.0m  RainRate: 91.7mm/hr      |
|------------------------------------------------------------------------|
|DENSITY     |Uplink Pwr Den: -55.1 dBW/Hz, Dnlink EIRP Den: -38.0 dBW/Hz |
|INFORMATION |Max Dnlink PFD: -164.5 dB(W/m2/4kHz) @ Beam Center          |
|------------------------------------------------------------------------|
|AVAILABILITY|Uplink: 99.998%,  Dnlink: 99.998%,  Composite Link: 99.995% |
|------------------------------------------------------------------------|
|LOSS IN C/(N+I) DUE TO ADJ SAT INTF: PAS3 = 1.5dB, THRDS-6 = 1.2dB      |
--------------------------------------------------------------------------
SATOPT5_PAS (Version 5.74)
PanAmSat, Customer Support Engineering.


PAS-1R-4C QPSK 1750kHz TEGUCIGALP(3.8m) to HAVANA(3.8m)
[ Input Data ]

--------------------------------- SATELLITE ---------------------------------

Satellite Name  : PAS-1R              Location   (deg): 45.0W
Uplink Beam     : US_LAM_CVUP         Dnlink Beam     : US_LAM_CVDN
Trans. BW  (MHz): 36.0 MHz            Trans. Type     : LTWTA_C
Uplink Pol.     : V                   Dnlink Pol.     : V
Uplink Chan.    : 3C                  Dnlink Chan.    : 4C
Uplink Frequency     (GHz): 6.000     Dnlink Frequency     (GHz): 3.775
G/T, beam center    (dB/K): 1.29      EIRP, beam center    (dBW): 43.36
G/T, beam edge      (dB/K): -10.0     EIRP, beam edge      (dBW): 34.0
G/T, toward Tx ES   (dB/K): -.1       EIRP, toward Rx ES   (dBW): 40.8
SFD, beam edge    (dBW/m2): -79.1
SFD, toward Tx ES (dBW/m2): -89.0

--------------------------- OPERATING CONDITIONS ---------------------------

Attenuator Setting (dB): 8.0          Nominal Uplink Co-Chan C/I (dB): 27
Input Backoff      (dB): 5.0          Nominal Dnlink Co-Chan C/I (dB): 27
Output Backoff     (dB): *            Minimum Uplink Rain Margin (dB):  0.5*
(C/Im) - Nominal   (dB): *            Actual  Uplink Rain Margin (dB):  2.5
Min. System Margin (dB): 1.0          Uplink Power Control Margin(dB):  .0
Max No Carriers / Trans: *            Minimum Dnlink Rain Margin (dB):  0.5*
Required Link Availability: 99.9      Actual  Dnlink Rain Margin (dB):  7.8
                                      Dnlink Pointing Error      (dB):  0.5

-- ADJACENT SATELLITE INTERFERENCE ----- Sat. No. 1 -------- Sat. No. 2 -----

Interfering Satellite Name          :      PAS3               THRDS-6
Interfering Satellite Location  (deg):     43W                47W
Uplink Interference    (dB or dBW/Hz):     -46                -46
Uplink Polarization Advantage    (dB):     0                  0
Downlink Interference  (dB or dBW/Hz):     -37.6              -35.2
Downlink Polarization Advantage  (dB):     0                  0
Rx E/S Topocentric Angle        (deg):     2.11               2.12
Rx E/S Pointing Error           (deg):     -0.30              0.30
Rx E/S Off-Axis Angle           (deg):     1.81               2.42
Rx E/S Adj. Sat. Discrimination  (dB):     18.3               21.8

--------------------------- CARRIER PARAMETERS ---------------------------


Modem Type     : Linkway 2100         C/N         (operating, dB): 4.3
Modulation     : QPSK                 Eb/No       (operating, dB): 5.5
Code Rate      : 1/2x216/236-V        C/N         (threshold, dB): 4.3
Info Rate (kbps): 1144                Eb/No       (threshold, dB): 5.5
Occupied Bandwidth  (kHz): 1500
Allocated Bandwidth (kHz): 1750
```

```
------ Transmit Earth Station ------    ------- Receive Earth Station -------

Location: HONDURAS__TEGUCIGALP          Location: CUBA__HAVANA
Latitude       (deg): 14.1N             Latitude       (deg): 23.1N
Longitude      (deg): 87.2W             Longitude      (deg): 82.4W
Rain Rate    (mm/hr): 76.1              Rain Rate    (mm/hr): 91.7
E/S Type or Model No: 1381              E/S Type or Model No: 1381
E/S Manufacturer    : PRODELIN          E/S Manufacturer    : PRODELIN
E/S Diam.        (m): 3.8               E/S Diam.        (m): 3.8
E/S Freq  (nom, GHz): 6.175             E/S Freq  (nom, GHz): 3.95
E/S Tx Gain    (dBi): 46.0              E/S Gain  (nom, dBi): 42.1
ULPC Margin     (dB): .0                E/S Feed Loss   (dB): 0.20
                                        E/S Ant. Temp(deg K): 25
                                        E/S LNA Temp (deg K): 20
                                        E/S G/T  (nom, dB/K): *

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 22-Aug-07 16:18    INPUT FILE: C:\SATOPT5_PAS74\Link Budgets\ICAO Lima - Manaus\PAS-1R-4C
TEGUCIGALP(3_8m) to HAVANA(3_8m).DTA
 PanAmSat, Customer Support Engineering.
```

ATTACHMENT 5

PAS-1R-4C QPSK 1750kHz TEGUCIGALP(3.8m) to KINGSTON(3.8m)

SATELLITE DATA	Satellite : PAS-1R		Location: 45.0W	
	Uplink Beam: US_LAM_CVUP		Dnlink Beam: US_LAM_CVDN	
	Uplink POL: V, Dnlink POL: V, EIRP, beam center: 43.36 dBW			
	G/T:-.1 dB/K, SFD:-89.0 dBW/m2		Dnlink EIRP: 40.8 dBW	
TRANSPONDER DATA	Trans Bandwidth :36.0 MHz		Trans Type: LTWTA_C	
	Uplink Frequency:6.000 GHz		Dnlink Freq: 3.775 GHz	
	IBO (Nominal) : 5.0 dB		OBO (Nominal): 3.5 dB	
CARRIER DATA	Type: Linkway 2100, Info Rate: 1144 kbps, Mod: QPSK, 1/2x21			
	BWo: 1500kHz, BWa: 1750kHz, C/N: 4.3dB, C/N_thresh: 4.3dB			
	LINK BUDGET		CLR SKY	UP FADE	DN FADE
UPLINK PERFORMANCE	Earth Station EIRP	(dBW)	52.2	52.2	52.2
	- Uplink Path Loss, clear sky	(dB)	-199.6	-199.6	-199.6
	- Uplink Rain Attenuation	(dB)	0.0	-2.4	0.0
	+ Satellite G/T	(dB/K)	-.1	-.1	-.1
	- Boltzman's Constant	(dBW/K-Hz)	228.6	228.6	228.6
	- Carrier Noise Bandwidth	(dB-Hz)	-61.8	-61.8	-61.8
	C/N Uplink	(dB)	19.3	16.9	19.3
DOWNLINK PERFORMANCE	Satellite Saturation EIRP	(dBW)	40.8	40.8	40.8
	- Carrier Output Backoff	(dB)	-19.8	-22.2	-19.8
	Downlink EIRP per carrier	(dBW)	21.0	18.6	21.0
	- Earth Station Pointing Error	(dB)	-.5	-.5	-.5
	- Downlink Path Loss, clear sky	(dB)	-195.4	-195.4	-195.4
	- Downlink Rain Attenuation	(dB)	0.0	0.0	-2.7
	+ Earth Station G/T	(dB/K)	24.0	24.0	19.0
	- Boltzman's Constant	(dBW/K-Hz)	228.6	228.6	228.6
	- Carrier Noise Bandwidth	(dB-Hz)	-61.8	-61.8	-61.8
	C/N Dnlink	(dB)	15.9	13.4	8.2
	C/N Uplink	(dB)	19.3	16.9	19.3
	C/N Dnlink	(dB)	15.9	13.4	8.2
	C/I Intermod	(dB)	14.7	12.4	14.7
	C/I Uplink Co-channel	(dB)	23.8	21.4	23.8
	C/I Dnlink Co-Channel	(dB)	23.8	21.4	23.8
	C/I Uplink Adj. Sat. (PAS3)	(dB)	17.0	14.6	17.0
	C/I Dnlink Adj. Sat. (PAS3)	(dB)	15.6	13.2	15.6
	C/I Uplink Adj. Sat. (THRDS-6)	(dB)	17.0	14.6	17.0
	C/I Dnlink Adj. Sat. (THRDS-6)	(dB)	16.4	13.9	16.4
COMPOSITE PERFORMANCE	C/(N+I) COMPOSITE	(dB)	7.7	5.3	5.3
	- Required System Margin	(dB)	-1.0	-1.0	-1.0
	Net C/(N+I) COMPOSITE	(dB)	6.7	4.3	4.3
	- Minimum Required C/N	(dB)	-4.3	-4.3	-4.3
	Excess Link Margin	(dB)	2.4	0.0	0.0
TRANSPONDER UTILIZATION	% BW/CARR: 4.86, % PWR/CARR: 2.33, Max No. Carriers: 20.6				
	Downlink EIRP per carrier toward beam center: 23.5 dBW				
TRANSMIT EARTH STATION	Loc: HONDURAS__TEGUCIGA ID:1381		AZ: 105.0 Elev: 39.2		
	LAT: 14.1N LON: 87.2W ALT: 1370m		RainRate: 76.1mm/hr		
	Carrier Power: 4.4 watts				

```
|RECEIVE     |Loc: JAMAICA__KINGSTON  ID:1381        AZ: 116.5 Elev: 48.2 |
|EARTH STA.  |LAT: 18.0N  LON: 76.8W  ALT: 300.m  RainRate: 100.mm/hr      |
|-------------------------------------------------------------------------|
|DENSITY     |Uplink Pwr Den: -55.3 dBW/Hz, Dnlink EIRP Den: -38.2 dBW/Hz |
|INFORMATION |Max Dnlink PFD: -164.6 dB(W/m2/4kHz) @ Beam Center           |
|-------------------------------------------------------------------------|
|AVAILABILITY|Uplink: 99.997%,  Dnlink: 99.998%,  Composite Link: 99.995% |
|-------------------------------------------------------------------------|
|LOSS IN C/(N+I) DUE TO ADJ SAT INTF: PAS3 = 1.4dB, THRDS-6 = 1.3dB       |
---------------------------------------------------------------------------
SATOPT5_PAS (Version 5.74)
PanAmSat, Customer Support Engineering.



PAS-1R-4C QPSK 1750kHz TEGUCIGALP(3.8m) to KINGSTON(3.8m)
[ Input Data ]

--------------------------------- SATELLITE ---------------------------------

Satellite Name  : PAS-1R               Location   (deg): 45.0W
Uplink Beam     : US_LAM_CVUP          Dnlink Beam     : US_LAM_CVDN
Trans. BW  (MHz): 36.0 MHz             Trans. Type     : LTWTA_C
Uplink Pol.     : V                    Dnlink Pol.     : V
Uplink Chan.    : 3C                   Dnlink Chan.    : 4C
Uplink Frequency     (GHz): 6.000      Dnlink Frequency     (GHz): 3.775
G/T, beam center    (dB/K): 1.29       EIRP, beam center    (dBW): 43.36
G/T, beam edge      (dB/K): -10.0      EIRP, beam edge      (dBW): 34.0
G/T, toward Tx ES   (dB/K): -.1        EIRP, toward Rx ES   (dBW): 40.8
SFD, beam edge    (dBW/m2): -79.1
SFD, toward Tx ES (dBW/m2): -89.0

---------------------------- OPERATING CONDITIONS ----------------------------

Attenuator Setting (dB): 8.0           Nominal Uplink Co-Chan C/I (dB): 27
Input Backoff      (dB): 5.0           Nominal Dnlink Co-Chan C/I (dB): 27
Output Backoff     (dB): *             Minimum Uplink Rain Margin (dB):  0.5*
(C/Im) - Nominal   (dB): *             Actual  Uplink Rain Margin (dB):  2.4
Min. System Margin (dB): 1.0           Uplink Power Control Margin(dB):  .0
Max No Carriers / Trans: *             Minimum Dnlink Rain Margin (dB):  0.5*
Required Link Availability: 99.9       Actual  Dnlink Rain Margin (dB):  7.6
                                       Dnlink Pointing Error      (dB):  0.5

-- ADJACENT SATELLITE INTERFERENCE ----- Sat. No. 1 -------- Sat. No. 2 -----

Interfering Satellite Name           :      PAS3               THRDS-6
Interfering Satellite Location  (deg):      43W                47W
Uplink Interference    (dB or dBW/Hz):      -46                -46
Uplink Polarization Advantage    (dB):      0                  0
Downlink Interference  (dB or dBW/Hz):      -37.6              -35.2
Downlink Polarization Advantage  (dB):      0                  0
Rx E/S Topocentric Angle        (deg):      2.14               2.15
Rx E/S Pointing Error           (deg):      -0.30              0.30
Rx E/S Off-Axis Angle           (deg):      1.84               2.45
Rx E/S Adj. Sat. Discrimination  (dB):      18.8               21.9

---------------------------- CARRIER PARAMETERS ----------------------------

Modem Type     : Linkway 2100          C/N         (operating, dB): 4.3
Modulation     : QPSK                  Eb/No       (operating, dB): 5.5
Code Rate      : 1/2x216/236-V         C/N         (threshold, dB): 4.3
Info Rate (kbps): 1144                 Eb/No       (threshold, dB): 5.5
Occupied Bandwidth  (kHz): 1500
Allocated Bandwidth (kHz): 1750

------ Transmit Earth Station ------    ------- Receive Earth Station -------
```

```
 Location: HONDURAS__TEGUCIGALP        Location: JAMAICA__KINGSTON
 Latitude       (deg): 14.1N           Latitude       (deg): 18.0N
 Longitude      (deg): 87.2W           Longitude      (deg): 76.8W
 Rain Rate    (mm/hr): 76.1            Rain Rate    (mm/hr): 100.
 E/S Type or Model No: 1381            E/S Type or Model No: 1381
 E/S Manufacturer    : PRODELIN        E/S Manufacturer    : PRODELIN
 E/S Diam.        (m): 3.8             E/S Diam.        (m): 3.8
 E/S Freq  (nom, GHz): 6.175           E/S Freq  (nom, GHz): 3.95
 E/S Tx Gain    (dBi): 46.0            E/S Gain  (nom, dBi): 42.1
 ULPC Margin     (dB): .0              E/S Feed Loss   (dB): 0.20
                                       E/S Ant. Temp(deg K): 25
                                       E/S LNA Temp (deg K): 20
                                       E/S G/T  (nom, dB/K): *

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 22-Aug-07 16:17    INPUT FILE: C:\SATOPT5_PAS74\Link Budgets\ICAO Lima - Manaus\PAS-1R-4C
TEGUCIGALP(3_8m) to KINGSTON(3_8m).DTA
 PanAmSat, Customer Support Engineering.
```

ATTACHMENT 6

PAS-1R-4C QPSK 1750kHz TEGUCIGALP(3.8m) to Manaus(3.7m)

SATELLITE DATA	Satellite : PAS-1R	Location: 45.0W		
	Uplink Beam: US_LAM_CVUP	Dnlink Beam: US_LAM_CVDN		
	Uplink POL: V, Dnlink POL: V, EIRP, beam center: 43.36 dBW			
	G/T:-.1 dB/K, SFD:-89.0 dBW/m2	Dnlink EIRP: 39.7 dBW		
TRANSPONDER DATA	Trans Bandwidth :36.0 MHz	Trans Type: LTWTA_C		
	Uplink Frequency:6.000 GHz	Dnlink Freq: 3.775 GHz		
	IBO (Nominal) : 5.0 dB	OBO (Nominal): 3.5 dB		
CARRIER DATA	Type: Linkway 2100, Info Rate: 1144 kbps, Mod: QPSK, 1/2x21			
	BWo: 1500kHz, BWa: 1750kHz, C/N: 4.3dB, C/N_thresh: 4.3dB			
	LINK BUDGET		CLR SKY	UP FADE	DN FADE
UPLINK PERFORMANCE	Earth Station EIRP	(dBW)	53.3	53.3	53.3
	- Uplink Path Loss, clear sky	(dB)	-199.6	-199.6	-199.6
	- Uplink Rain Attenuation	(dB)	0.0	-2.5	0.0
	+ Satellite G/T	(dB/K)	-.1	-.1	-.1
	- Boltzman's Constant	(dBW/K-Hz)	228.6	228.6	228.6
	- Carrier Noise Bandwidth	(dB-Hz)	-61.8	-61.8	-61.8
	C/N Uplink	(dB)	20.5	18.0	20.5
	Satellite Saturation EIRP	(dBW)	39.7	39.7	39.7
	- Carrier Output Backoff	(dB)	-18.7	-21.2	-18.7
	Downlink EIRP per carrier	(dBW)	21.0	18.5	21.0
	- Earth Station Pointing Error	(dB)	-.5	-.5	-.5
DOWNLINK PERFORMANCE	- Downlink Path Loss, clear sky	(dB)	-195.1	-195.1	-195.1
	- Downlink Rain Attenuation	(dB)	0.0	0.0	-2.4
	+ Earth Station G/T	(dB/K)	22.0	22.0	18.0
	- Boltzman's Constant	(dBW/K-Hz)	228.6	228.6	228.6
	- Carrier Noise Bandwidth	(dB-Hz)	-61.8	-61.8	-61.8
	C/N Dnlink	(dB)	14.2	11.7	7.8
	C/N Uplink	(dB)	20.5	18.0	20.5
	C/N Dnlink	(dB)	14.2	11.7	7.8
	C/I Intermod	(dB)	15.8	13.4	15.8
	C/I Uplink Co-channel	(dB)	24.9	22.4	24.9
	C/I Dnlink Co-Channel	(dB)	24.9	22.4	24.9
	C/I Uplink Adj. Sat. (PAS3)	(dB)	18.2	15.7	18.2
	C/I Dnlink Adj. Sat. (PAS3)	(dB)	15.2	12.7	15.2
	C/I Uplink Adj. Sat. (THRDS-6)	(dB)	18.2	15.7	18.2
	C/I Dnlink Adj. Sat. (THRDS-6)	(dB)	15.8	13.3	15.8
COMPOSITE PERFORMANCE	C/(N+I) COMPOSITE	(dB)	7.8	5.3	5.3
	- Required System Margin	(dB)	-1.0	-1.0	-1.0
	Net C/(N+I) COMPOSITE	(dB)	6.8	4.3	4.3
	- Minimum Required C/N	(dB)	-4.3	-4.3	-4.3
	Excess Link Margin	(dB)	2.5	0.0	0.0
TRANSPONDER UTILIZATION	% BW/CARR: 4.86, % PWR/CARR: 3.02, Max No. Carriers: 20.6				
	Downlink EIRP per carrier toward beam center: 24.7 dBW				
TRANSMIT EARTH STATION	Loc: HONDURAS__TEGUCIGA ID:1381	AZ: 105.0 Elev: 39.2			
	LAT: 14.1N LON: 87.2W ALT: 1370m	RainRate: 76.1mm/hr			
	Carrier Power: 5.7 watts				

```
|RECEIVE     |Loc: BRAZIL__Manaus     ID: AZ: 78.6 Elev: 72.0             |
|EARTH STA.  |LAT: 3.1S  LON: 60.0W  ALT: 30.0m  RainRate: 109.mm/hr      |
|------------------------------------------------------------------------|
|DENSITY     |Uplink Pwr Den: -54.2 dBW/Hz, Dnlink EIRP Den: -37.1 dBW/Hz |
|INFORMATION |Max Dnlink PFD: -163.2 dB(W/m2/4kHz) @ Beam Center          |
|------------------------------------------------------------------------|
|AVAILABILITY|Uplink: 99.998%,  Dnlink: 99.998%,  Composite Link: 99.995% |
|------------------------------------------------------------------------|
|LOSS IN C/(N+I) DUE TO ADJ SAT INTF: PAS3 = 1.4dB, THRDS-6 = 1.3dB      |
--------------------------------------------------------------------------
SATOPT5_PAS (Version 5.74)
PanAmSat, Customer Support Engineering.


PAS-1R-4C QPSK 1750kHz TEGUCIGALP(3.8m) to Manaus(3.7m)
[ Input Data ]

--------------------------------- SATELLITE ---------------------------------

Satellite Name  : PAS-1R              Location   (deg): 45.0W
Uplink Beam     : US_LAM_CVUP         Dnlink Beam     : US_LAM_CVDN
Trans. BW  (MHz): 36.0 MHz            Trans. Type     : LTWTA_C
Uplink Pol.     : V                   Dnlink Pol.     : V
Uplink Chan.    : 3C                  Dnlink Chan.    : 4C
Uplink Frequency     (GHz): 6.000     Dnlink Frequency     (GHz): 3.775
G/T, beam center    (dB/K): 1.29      EIRP, beam center    (dBW): 43.36
G/T, beam edge      (dB/K): -10.0     EIRP, beam edge      (dBW): 34.0
G/T, toward Tx ES   (dB/K): -.1       EIRP, toward Rx ES   (dBW): 39.7
SFD, beam edge    (dBW/m2): -79.1
SFD, toward Tx ES (dBW/m2): -89.0

---------------------------- OPERATING CONDITIONS ----------------------------

Attenuator Setting (dB): 8.0          Nominal Uplink Co-Chan C/I (dB): 27
Input Backoff      (dB): 5.0          Nominal Dnlink Co-Chan C/I (dB): 27
Output Backoff     (dB): *            Minimum Uplink Rain Margin (dB):  0.5*
(C/Im) - Nominal   (dB): *            Actual  Uplink Rain Margin (dB):  2.5
Min. System Margin (dB): 1.0          Uplink Power Control Margin(dB):  .0
Max No Carriers / Trans: *            Minimum Dnlink Rain Margin (dB):  0.5*
Required Link Availability: 99.9      Actual  Dnlink Rain Margin (dB):  6.5
                                      Dnlink Pointing Error      (dB):  0.5

-- ADJACENT SATELLITE INTERFERENCE ----- Sat. No. 1 -------- Sat. No. 2 -----

Interfering Satellite Name          :      PAS3               THRDS-6
Interfering Satellite Location  (deg):     43W                47W
Uplink Interference    (dB or dBW/Hz):     -46                -46
Uplink Polarization Advantage    (dB):     0                  0
Downlink Interference  (dB or dBW/Hz):     -37.6              -35.2
Downlink Polarization Advantage  (dB):     0                  0
Rx E/S Topocentric Angle        (deg):     2.22               2.22
Rx E/S Pointing Error           (deg):     -0.30              0.30
Rx E/S Off-Axis Angle           (deg):     1.92               2.52
Rx E/S Adj. Sat. Discrimination  (dB):     18.4               21.3

---------------------------- CARRIER PARAMETERS ----------------------------


Modem Type     : Linkway 2100         C/N         (operating, dB): 4.3
Modulation     : QPSK                 Eb/No       (operating, dB): 5.5
Code Rate      : 1/2x216/236-V        C/N         (threshold, dB): 4.3
Info Rate (kbps): 1144                Eb/No       (threshold, dB): 5.5
Occupied Bandwidth  (kHz): 1500
Allocated Bandwidth (kHz): 1750
```

```
------ Transmit Earth Station ------    ------- Receive Earth Station -------

Location: HONDURAS__TEGUCIGALP          Location: BRAZIL__Manaus
Latitude       (deg): 14.1N             Latitude       (deg): 3.1S
Longitude      (deg): 87.2W             Longitude      (deg): 60.0W
Rain Rate    (mm/hr): 76.1              Rain Rate    (mm/hr): 109.5
E/S Type or Model No: 1381              E/S Type or Model No:
E/S Manufacturer    : PRODELIN          E/S Manufacturer    : STANDARD
E/S Diam.        (m): 3.8               E/S Diam.        (m): 3.7
E/S Freq  (nom, GHz): 6.175             E/S Freq  (nom, GHz): 3.95
E/S Tx Gain    (dBi): 46.0              E/S Gain  (nom, dBi): 41.2
ULPC Margin     (dB): .0                E/S Feed Loss   (dB): 0.20
                                        E/S Ant. Temp(deg K): 25
                                        E/S LNA Temp (deg K): 35
                                        E/S G/T  (nom, dB/K): *

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 22-Aug-07 16:20    INPUT FILE: C:\SATOPT5_PAS74\Link Budgets\ICAO Lima - Manaus\PAS-1R-4C
TEGUCIGALP(3_8m) to Manaus(3_7m).DTA
 PanAmSat, Customer Support Engineering.
```

ATTACHMENT 7

PAS-1R-4C QPSK 1750kHz TEGUCIGALP(3.8m) to Miami(7.0m)

SATELLITE DATA	Satellite : PAS-1R	Location: 45.0W		
	Uplink Beam: US_LAM_CVUP	Dnlink Beam: US_LAM_CVDN		
	Uplink POL: V, Dnlink POL: V, EIRP, beam center: 43.36 dBW			
	G/T:-.1 dB/K, SFD:-89.0 dBW/m2	Dnlink EIRP: 39.2 dBW		
TRANSPONDER DATA	Trans Bandwidth :36.0 MHz	Trans Type: LTWTA_C		
	Uplink Frequency:6.000 GHz	Dnlink Freq: 3.775 GHz		
	IBO (Nominal) : 5.0 dB	OBO (Nominal): 3.5 dB		
CARRIER DATA	Type: Linkway 2100, Info Rate: 1144 kbps, Mod: QPSK, 1/2x21			
	BWo: 1500kHz, BWa: 1750kHz, C/N: 4.3dB, C/N_thresh: 4.3dB			
	LINK BUDGET		CLR SKY	UP FADE	DN FADE
UPLINK PERFORMANCE	Earth Station EIRP	(dBW)	51.1	51.1	51.1
	- Uplink Path Loss, clear sky	(dB)	-199.6	-199.6	-199.6
	- Uplink Rain Attenuation	(dB)	0.0	-2.4	0.0
	+ Satellite G/T	(dB/K)	-.1	-.1	-.1
	- Boltzman's Constant	(dBW/K-Hz)	228.6	228.6	228.6
	- Carrier Noise Bandwidth	(dB-Hz)	-61.8	-61.8	-61.8
	C/N Uplink	(dB)	18.3	15.8	18.3
DOWNLINK PERFORMANCE	Satellite Saturation EIRP	(dBW)	39.2	39.2	39.2
	- Carrier Output Backoff	(dB)	-20.9	-23.3	-20.9
	Downlink EIRP per carrier	(dBW)	18.3	15.9	18.3
	- Earth Station Pointing Error	(dB)	-.5	-.5	-.5
	- Downlink Path Loss, clear sky	(dB)	-195.5	-195.5	-195.5
	- Downlink Rain Attenuation	(dB)	0.0	0.0	-3.9
	+ Earth Station G/T	(dB/K)	27.5	27.5	23.1
	- Boltzman's Constant	(dBW/K-Hz)	228.6	228.6	228.6
	- Carrier Noise Bandwidth	(dB-Hz)	-61.8	-61.8	-61.8
	C/N Dnlink	(dB)	16.6	14.2	8.3
COMPOSITE PERFORMANCE	C/N Uplink	(dB)	18.3	15.8	18.3
	C/N Dnlink	(dB)	16.6	14.2	8.3
	C/I Intermod	(dB)	13.6	11.2	13.6
	C/I Uplink Co-channel	(dB)	22.7	20.3	22.7
	C/I Dnlink Co-Channel	(dB)	22.7	20.3	22.7
	C/I Uplink Adj. Sat. (PAS3)	(dB)	15.9	13.5	15.9
	C/I Dnlink Adj. Sat. (PAS3)	(dB)	19.0	16.6	19.0
	C/I Uplink Adj. Sat. (THRDS-6)	(dB)	15.9	13.5	15.9
	C/I Dnlink Adj. Sat. (THRDS-6)	(dB)	18.3	15.9	18.3
	C/(N+I) COMPOSITE	(dB)	7.7	5.3	5.3
	- Required System Margin	(dB)	-1.0	-1.0	-1.0
	Net C/(N+I) COMPOSITE	(dB)	6.7	4.3	4.3
	- Minimum Required C/N	(dB)	-4.3	-4.3	-4.3
	Excess Link Margin	(dB)	2.4	0.0	0.0
TRANSPONDER UTILIZATION	% BW/CARR: 4.86, % PWR/CARR: 1.81, Max No. Carriers: 20.6				
	Downlink EIRP per carrier toward beam center: 22.4 dBW				
TRANSMIT EARTH STATION	Loc: HONDURAS__TEGUCIGA ID:1381	AZ: 105.0 Elev: 39.2			
	LAT: 14.1N LON: 87.2W ALT: 1370m	RainRate: 76.1mm/hr			
	Carrier Power: 3.4 watts				

```
|RECEIVE     |Loc: USA__Miami         ID: AZ: 121.7 Elev: 40.8            |
|EARTH STA.  |LAT: 25.8N  LON: 80.2W  ALT: 0.0m  RainRate: 95.7mm/hr      |
|-------------------------------------------------------------------------|
|DENSITY     |Uplink Pwr Den: -56.4 dBW/Hz, Dnlink EIRP Den: -39.3 dBW/Hz |
|INFORMATION |Max Dnlink PFD: -165.8 dB(W/m2/4kHz) @ Beam Center           |
|-------------------------------------------------------------------------|
|AVAILABILITY|Uplink: 99.997%,  Dnlink: 99.998%,  Composite Link: 99.995% |
|-------------------------------------------------------------------------|
|LOSS IN C/(N+I) DUE TO ADJ SAT INTF: PAS3 = 1.1dB, THRDS-6 = 1.2dB       |
---------------------------------------------------------------------------
SATOPT5_PAS (Version 5.74)
PanAmSat, Customer Support Engineering.



PAS-1R-4C QPSK 1750kHz TEGUCIGALP(3.8m) to Miami(7.0m)
[ Input Data ]

--------------------------------- SATELLITE ---------------------------------

Satellite Name  : PAS-1R              Location   (deg): 45.0W
Uplink Beam     : US_LAM_CVUP         Dnlink Beam     : US_LAM_CVDN
Trans. BW  (MHz): 36.0 MHz            Trans. Type     : LTWTA_C
Uplink Pol.     : V                   Dnlink Pol.     : V
Uplink Chan.    : 3C                  Dnlink Chan.    : 4C
Uplink Frequency     (GHz): 6.000     Dnlink Frequency     (GHz): 3.775
G/T, beam center    (dB/K): 1.29      EIRP, beam center    (dBW): 43.36
G/T, beam edge      (dB/K): -10.0     EIRP, beam edge      (dBW): 34.0
G/T, toward Tx ES   (dB/K): -.1       EIRP, toward Rx ES   (dBW): 39.2
SFD, beam edge    (dBW/m2): -79.1
SFD, toward Tx ES (dBW/m2): -89.0

--------------------------- OPERATING CONDITIONS ---------------------------

Attenuator Setting (dB): 8.0          Nominal Uplink Co-Chan C/I (dB): 27
Input Backoff      (dB): 5.0          Nominal Dnlink Co-Chan C/I (dB): 27
Output Backoff     (dB): *            Minimum Uplink Rain Margin (dB):  0.5*
(C/Im) - Nominal   (dB): *            Actual  Uplink Rain Margin (dB):  2.4
Min. System Margin (dB): 1.0          Uplink Power Control Margin(dB):  .0
Max No Carriers / Trans: *            Minimum Dnlink Rain Margin (dB):  0.5*
Required Link Availability: 99.9      Actual  Dnlink Rain Margin (dB):  8.3
                                      Dnlink Pointing Error      (dB):  0.5

-- ADJACENT SATELLITE INTERFERENCE ----- Sat. No. 1 -------- Sat. No. 2 -----

Interfering Satellite Name          :      PAS3               THRDS-6
Interfering Satellite Location  (deg):     43W                47W
Uplink Interference    (dB or dBW/Hz):     -46                -46
Uplink Polarization Advantage    (dB):     0                  0
Downlink Interference  (dB or dBW/Hz):     -37.6              -35.2
Downlink Polarization Advantage  (dB):     0                  0
Rx E/S Topocentric Angle        (deg):     2.11               2.12
Rx E/S Pointing Error           (deg):     -0.16              0.16
Rx E/S Off-Axis Angle           (deg):     1.95               2.28
Rx E/S Adj. Sat. Discrimination  (dB):     24.9               26.6

--------------------------- CARRIER PARAMETERS ---------------------------


Modem Type     : Linkway 2100         C/N         (operating, dB): 4.3
Modulation     : QPSK                 Eb/No       (operating, dB): 5.5
Code Rate      : 1/2x216/236-V        C/N         (threshold, dB): 4.3
Info Rate (kbps): 1144                Eb/No       (threshold, dB): 5.5
Occupied Bandwidth  (kHz): 1500
Allocated Bandwidth (kHz): 1750
```

```
------ Transmit Earth Station ------    ------- Receive Earth Station -------

Location: HONDURAS__TEGUCIGALP          Location: USA__Miami
Latitude       (deg): 14.1N             Latitude       (deg): 25.8N
Longitude      (deg): 87.2W             Longitude      (deg): 80.2W
Rain Rate    (mm/hr): 76.1              Rain Rate    (mm/hr): 95.7
E/S Type or Model No: 1381              E/S Type or Model No:
E/S Manufacturer    : PRODELIN          E/S Manufacturer    : STANDARD
E/S Diam.        (m): 3.8               E/S Diam.        (m): 7.0
E/S Freq  (nom, GHz): 6.175             E/S Freq  (nom, GHz): 3.95
E/S Tx Gain    (dBi): 46.0              E/S Gain  (nom, dBi): 47.5
ULPC Margin     (dB): .0                E/S Feed Loss   (dB): 0.15
                                        E/S Ant. Temp(deg K): 45
                                        E/S LNA Temp (deg K): 35
                                        E/S G/T  (nom, dB/K): *

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 22-Aug-07 16:09    INPUT FILE: C:\SATOPT5_PAS74\Link Budgets\ICAO Lima - Manaus\PAS-1R-4C
TEGUCIGALP(3_8m) to Miami(7_0m).DTA
 PanAmSat, Customer Support Engineering.
```

ATTACHMENT 8

PAS-1R-4C QPSK 1750kHz TEGUCIGALP(3.8m) to PANAMA_CITY(3.8m)

SATELLITE DATA	Satellite : PAS-1R	Location: 45.0W		
	Uplink Beam: US_LAM_CVUP	Dnlink Beam: US_LAM_CVDN		
	Uplink POL: V, Dnlink POL: V, EIRP, beam center: 43.36 dBW			
	G/T:-.1 dB/K, SFD:-89.0 dBW/m2 Dnlink EIRP: 42.8 dBW			
TRANSPONDER DATA	Trans Bandwidth :36.0 MHz	Trans Type: LTWTA_C		
	Uplink Frequency:6.000 GHz	Dnlink Freq: 3.775 GHz		
	IBO (Nominal) : 5.0 dB	OBO (Nominal): 3.5 dB		
CARRIER DATA	Type: Linkway 2100, Info Rate: 1144 kbps, Mod: QPSK, 1/2x21			
	BWo: 1500kHz, BWa: 1750kHz, C/N: 4.3dB, C/N_thresh: 4.3dB			
	LINK BUDGET		CLR SKY	UP FADE	DN FADE
UPLINK PERFORMANCE	Earth Station EIRP	(dBW)	51.4	51.4	51.4
	- Uplink Path Loss, clear sky	(dB)	-199.6	-199.6	-199.6
	- Uplink Rain Attenuation	(dB)	0.0	-2.4	0.0
	+ Satellite G/T	(dB/K)	-.1	-.1	-.1
	- Boltzman's Constant	(dBW/K-Hz)	228.6	228.6	228.6
	- Carrier Noise Bandwidth	(dB-Hz)	-61.8	-61.8	-61.8
	C/N Uplink	(dB)	18.6	16.1	18.6
DOWNLINK PERFORMANCE	Satellite Saturation EIRP	(dBW)	42.8	42.8	42.8
	- Carrier Output Backoff	(dB)	-20.6	-23.0	-20.6
	Downlink EIRP per carrier	(dBW)	22.2	19.8	22.2
	- Earth Station Pointing Error	(dB)	-.5	-.5	-.5
	- Downlink Path Loss, clear sky	(dB)	-195.4	-195.4	-195.4
	- Downlink Rain Attenuation	(dB)	0.0	0.0	-3.3
	+ Earth Station G/T	(dB/K)	24.0	24.0	18.5
	- Boltzman's Constant	(dBW/K-Hz)	228.6	228.6	228.6
	- Carrier Noise Bandwidth	(dB-Hz)	-61.8	-61.8	-61.8
	C/N Dnlink	(dB)	17.1	14.7	8.4
COMPOSITE PERFORMANCE	C/N Uplink	(dB)	18.6	16.1	18.6
	C/N Dnlink	(dB)	17.1	14.7	8.4
	C/I Intermod	(dB)	13.9	11.5	13.9
	C/I Uplink Co-channel	(dB)	23.0	20.6	23.0
	C/I Dnlink Co-Channel	(dB)	23.0	20.6	23.0
	C/I Uplink Adj. Sat. (PAS3)	(dB)	16.3	13.8	16.3
	C/I Dnlink Adj. Sat. (PAS3)	(dB)	16.9	14.4	16.9
	C/I Uplink Adj. Sat. (THRDS-6)	(dB)	16.3	13.8	16.3
	C/I Dnlink Adj. Sat. (THRDS-6)	(dB)	17.6	15.1	17.6
	C/(N+I) COMPOSITE	(dB)	7.7	5.3	5.3
	- Required System Margin	(dB)	-1.0	-1.0	-1.0
	Net C/(N+I) COMPOSITE	(dB)	6.7	4.3	4.3
	- Minimum Required C/N	(dB)	-4.3	-4.3	-4.3
	Excess Link Margin	(dB)	2.4	0.0	0.0
TRANSPONDER UTILIZATION	% BW/CARR: 4.86, % PWR/CARR: 1.94, Max No. Carriers: 20.6				
	Downlink EIRP per carrier toward beam center: 22.7 dBW				
TRANSMIT EARTH STATION	Loc: HONDURAS__TEGUCIGA ID:1381	AZ: 105.0 Elev: 39.2			
	LAT: 14.1N LON: 87.2W ALT: 1370m	RainRate: 76.1mm/hr			
	Carrier Power: 3.7 watts				

```
|RECEIVE     |Loc: PANAMA__PANAMA_CIT ID:1381        AZ: 102.8 Elev: 48.8 |
|EARTH STA.  |LAT: 9.0N  LON: 79.5W  ALT: 0.0m  RainRate: 115.mm/hr       |
|-------------------------------------------------------------------------|
|DENSITY     |Uplink Pwr Den: -56.1 dBW/Hz, Dnlink EIRP Den: -39.0 dBW/Hz |
|INFORMATION |Max Dnlink PFD: -165.4 dB(W/m2/4kHz) @ Beam Center          |
|-------------------------------------------------------------------------|
|AVAILABILITY|Uplink: 99.997%,  Dnlink: 99.998%,  Composite Link: 99.995% |
|-------------------------------------------------------------------------|
|LOSS IN C/(N+I) DUE TO ADJ SAT INTF: PAS3 = 1.3dB, THRDS-6 = 1.2dB       |
---------------------------------------------------------------------------
SATOPT5_PAS (Version 5.74)
PanAmSat, Customer Support Engineering.


PAS-1R-4C QPSK 1750kHz TEGUCIGALP(3.8m) to PANAMA_CITY(3.8m)
[ Input Data ]

--------------------------------- SATELLITE ---------------------------------

Satellite Name  : PAS-1R              Location   (deg): 45.0W
Uplink Beam     : US_LAM_CVUP         Dnlink Beam     : US_LAM_CVDN
Trans. BW  (MHz): 36.0 MHz            Trans. Type     : LTWTA_C
Uplink Pol.     : V                   Dnlink Pol.     : V
Uplink Chan.    : 3C                  Dnlink Chan.    : 4C
Uplink Frequency     (GHz): 6.000     Dnlink Frequency     (GHz): 3.775
G/T, beam center    (dB/K): 1.29      EIRP, beam center    (dBW): 43.36
G/T, beam edge      (dB/K): -10.0     EIRP, beam edge      (dBW): 34.0
G/T, toward Tx ES   (dB/K): -.1       EIRP, toward Rx ES   (dBW): 42.8
SFD, beam edge    (dBW/m2): -79.1
SFD, toward Tx ES (dBW/m2): -89.0

---------------------------- OPERATING CONDITIONS ----------------------------

Attenuator Setting (dB): 8.0          Nominal Uplink Co-Chan C/I (dB): 27
Input Backoff      (dB): 5.0          Nominal Dnlink Co-Chan C/I (dB): 27
Output Backoff     (dB): *            Minimum Uplink Rain Margin (dB):  0.5*
(C/Im) - Nominal   (dB): *            Actual  Uplink Rain Margin (dB):  2.4
Min. System Margin (dB): 1.0          Uplink Power Control Margin(dB):  .0
Max No Carriers / Trans: *            Minimum Dnlink Rain Margin (dB):  0.5*
Required Link Availability: 99.9      Actual  Dnlink Rain Margin (dB):  8.7
                                      Dnlink Pointing Error      (dB):  0.5

-- ADJACENT SATELLITE INTERFERENCE ----- Sat. No. 1 -------- Sat. No. 2 -----

Interfering Satellite Name          :      PAS3               THRDS-6
Interfering Satellite Location  (deg):     43W                47W
Uplink Interference    (dB or dBW/Hz):     -46                -46
Uplink Polarization Advantage    (dB):     0                  0
Downlink Interference  (dB or dBW/Hz):     -37.6              -35.2
Downlink Polarization Advantage  (dB):     0                  0
Rx E/S Topocentric Angle        (deg):     2.14               2.15
Rx E/S Pointing Error           (deg):     -0.30              0.30
Rx E/S Off-Axis Angle           (deg):     1.84               2.45
Rx E/S Adj. Sat. Discrimination  (dB):     18.8               21.9

---------------------------- CARRIER PARAMETERS ----------------------------

Modem Type     : Linkway 2100         C/N         (operating, dB): 4.3
Modulation     : QPSK                 Eb/No       (operating, dB): 5.5
Code Rate      : 1/2x216/236-V        C/N         (threshold, dB): 4.3
Info Rate (kbps): 1144                Eb/No       (threshold, dB): 5.5
Occupied Bandwidth  (kHz): 1500
Allocated Bandwidth (kHz): 1750

------ Transmit Earth Station ------    ------- Receive Earth Station -------
```

```
 Location: HONDURAS__TEGUCIGALP        Location: PANAMA__PANAMA_CITY
 Latitude       (deg): 14.1N           Latitude       (deg): 9.0N
 Longitude      (deg): 87.2W           Longitude      (deg): 79.5W
 Rain Rate    (mm/hr): 76.1            Rain Rate    (mm/hr): 115.
 E/S Type or Model No: 1381            E/S Type or Model No: 1381
 E/S Manufacturer    : PRODELIN        E/S Manufacturer    : PRODELIN
 E/S Diam.        (m): 3.8             E/S Diam.        (m): 3.8
 E/S Freq  (nom, GHz): 6.175           E/S Freq  (nom, GHz): 3.95
 E/S Tx Gain    (dBi): 46.0            E/S Gain  (nom, dBi): 42.1
 ULPC Margin     (dB): .0              E/S Feed Loss   (dB): 0.20
                                       E/S Ant. Temp(deg K): 25
                                       E/S LNA Temp (deg K): 20
                                       E/S G/T  (nom, dB/K): *

 SATOPT5 (Version 5.74)  (C) 2004 TEL/COM Sciences, Inc.  All Rights Reserved.
 22-Aug-07 16:11    INPUT FILE: C:\SATOPT5_PAS74\Link Budgets\ICAO Lima - Manaus\PAS-1R-4C
TEGUCIGALP(3_8m) to PANAMA_CITY(3_8m).DTA
 PanAmSat, Customer Support Engineering.
```

ATTACHMENT B

sysinfo

Motherboard:CX960e Access Switch, Rev:4, ECO:1, Id:30273003
Bootcode Revision: Feb 21 2003 13:00:51 XPG4.0 (Build:2)
Bootcode Checksum:0x9B9AD2
CPU Name:MPC745, Version:00083203, Frequency:333MHz
System memory:64 MB, FLASH memory:4 MB
Code:3578/3584 KB, Binary Config:31.3/384 KB, PMD:(0.0)/128 KB
Fallback Script:(0.0)/64 KB, Custom Script+Database:(5.9+6.1)/64 KB
Watch Dog Jumper:Absent
Cache Mode:Enabled
Data Buffers are: Not Cached
Application Version: 4.5.2 (XP504527) Jul 18 2006 15:27:09 Diab4.2b
Application Checksum:0x198AC7B6, Size:03664197
Application Features: VOIP/G.729/V110/8DIM
SEM is not present

CPU - Checksum, Number

Slot # : I/O Card Type	(ID) : Rev
1 : V.35H	(5) : 1.0
2 : V.24	(2) : 0.0
3 : EMPTY SLOT	(31) :
4 : EMPTY SLOT	(31) :
5 : EMPTY SLOT	(31) :
6 : EMPTY SLOT	(31) :
7 : C54 Dual Analog Voice	(13) : 2.0
8 : C54 Dual Analog Voice	(13) : 2.0

CX_Honduras.: module
[0] alias = CX_Honduras. sysram = 26600 dataram = 14262
uptimetick = 34292 rsttmout = 0
swrev = 4.5.2 (XP504527) Jul 18 2006 15:27:09 Diab4.2b
mibrev = 3 configid = CXTOOL_9/7/2006 8:14:14 PM - COCESNA- 1
approval = 0 timeout = 0

CX_Honduras.: =

Agenda Item 2: Review of the Approval Status of the Memorandum of Understanding (MoU) for the MEVA II/REDDIG Interconnection Solution

2.1 The Meeting analysed the results of the consultation process made with MEVA II and REDDIG Administrations, regarding the adoption of the Memorandum of Understanding (MoU), which was conducted by the ICAO NACC and SAM Regional Offices as follow-up to Conclusion 4/3 – *Adoption of the MEVA II / REDDIG Memorandum of Understanding* drafted by the Fourth MEVA II / REDDIG Coordination Meeting (MR/4).

2.2 The MEVA II / REDDIG Memorandum of Understanding (MoU), prepared by the MR/4 Meeting, was circulated by the ICAO NACC and SAM Regional Offices to the MEVA II and REDDIG networks member Administrations through letter N1/3.6.3 – EMX0282, dated 23 March 2007, and LN 3/20.3.4 – SA223 dated 28 March 2007.

2.3 Likewise, the Meeting recalled that the GREPECAS/14 Meeting, held in San José, Costa Rica from 16 to 20 April 2007, reviewed the development and integration/interconnection status of both regional networks, and drafted Conclusion 14/52 – *Review for the Adoption of the Memorandum of Understanding and Implementation of the Action Plan for the MEVA II / REDDIG Interconnection*, through which, among other aspects, urged MEVA II / REDDIG member Administrations to "study and review the feasibility to adopt the Memorandum of Understanding (MoU)."

2.4 The Meeting took note that as a result of the few responses received to the aforementioned communications, the ICAO NACC Office sent the MEVA II members letter Ref. N 1/3.6.3 – EMX0593, dated 19 June 2007, stating that if no response was received before 29 June 2007, it would be considered that Administrations agreed to the proposals with no comments. The SAM Regional Office issued a similar letter to REDDIG members (Ref. LN 3/20.3.4-SA399, dated 13 June 2007). **Appendix 2A** to this part of the Report presents a summary of the responses received up to the date of the Meeting by both Regional Offices regarding the MEVA II / REDDIG MoU.

2.5 As a result of analysis of the responses received regarding the MoU, the Meeting agreed on the following aspects and actions:

a) None of the responses received oppose continuation of the MEVA II / REDDIG Interconnection Process; therefore, the Action Plan for the interconnection implementation should continue.

b) Taking into account the proposals for amendment to the MoU received by the Regional Offices, the Meeting adopted the revised MoU, which is presented as **Appendix 2B** to this part of the Report. The changes made to the MoU have been made only to specify the solution for implementation of the MEVA II / REDDIG interconnection, as well as any aspects relevant to the form of doing so. The integration agreements are contemplated to be carried out by the end of the interconnection. It is considered that the essential technical-administrative content of the initial MoU version, which represents the main purpose of the document, has remained without major changes.

c) Considering the expressions in b) above, the Meeting agreed that the revised version of the MoU, which was adopted by this Meeting, should be re-circulated. Members are urged to sign the revised version of the MoU.

2.6 Consequently, after analysis of this issue, the Meeting adopted the following conclusion:

CONCLUSION MR/5/3 ADOPTION OF THE REVISED MoU FOR THE MEVA II / REDDIG INTERCONNECTION

That, member Administrations of the MEVA II / REDDIG VSAT Networks are urged to:

a) adopt through their signature, the revised Memorandum of Understanding (MoU) for the MEVA II / REDDIG interconnection, which is presented in Appendix 2B to this part of the Report, so that responses are received by the ICAO NACC and SAM Regional Offices before 30 November 2007; and

b) while the revised MoU becomes official, the execution of respective actions aimed at the interconnection implementation should continue.

APPENDIX 2A

Table 1 – Responses of the MEVA II Members on the MoU	
Signed the MoU:	**Comments**
United States	No comments
COCESNA	Needs clarification regarding the MoU Appendices.
Did not sign the MoU, but sent comments:	
Bahamas	Has no objection to the interconnection process. The MoU signature is pending depending on the economic implications that the MEVA II / REDDIG Interconnection may cause for the State.
Cuba	The MoU should be limited to the interconnection, the content of the pertinent Appendices should be completed and proposed modification to the text.
No response has been received:	
No responses have been received from the remaining MEVA II Members.	According to letter Ref. N1/3.6.3 – EMX0593, dated 19 June 2007, even after no comments have been received, it is considered that administrations agree with the MoU.

Table 2 – Responses of the REDDIG Members on the MoU	
Signed the MoU:	**Comments**
Argentina, Chile, France, Guyana, Paraguay , Suriname and Venezuela	Have accepted the MoU and the RFP with no comments.
Did not sign the MoU, but sent comments:	
Brazil, Colombia, Peru and Uruguay	Have accepted the MoU and the RFP.
No response has been received:	
Bolivia, Ecuador and Panama	According to letter Ref. LN 3/20.3.4-SA399, dated 13 June 2007, even after no comments have been received, it is considered that administrations agree with the MoU.

APPENDIX 2B

Amendment to the

MEMORANDUM OF UNDERSTANDING BETWEEN STATES/TERRITORIES/INTERNATIONAL ORGANISATIONS MEMBERS OF MEVA II AND REDDIG PROJECT ORGANISATION

1. SECTION 1. INTRODUCTION AND PURPOSE OF THIS DOCUMENT

1.1 INTRODUCTION

1.1.1 With the aim of effectively and efficiently fulfilling aeronautical telecommunications requirements in these regions, the members of the MEVA II and REDDIG VSAT networks decide to interconnect the two networks. For this purpose, the Members decided to establish this Memorandum of Understanding (MoU). This Agreement is being established jointly under coordination of the ICAO North American, Central American, and Caribbean (NACC) Office in Mexico City, Mexico and the ICAO South American (SAM) Office, in Lima, Peru.

1.1.2 The Third MEVA II / REDDIG Coordination Meeting (MR/3) concluded that the interconnection implementation will operate for a five-year period, as an initial basis, after finalising the implementation.

1.1.3 The main body of this document consists of four (4) sections and 2 Appendices. The content of the sections and appendices is summarised below: In accordance with the interconnection development, when considered necessary, and if the interested Parties of both networks agree to do so, other Appendices could be added as necessary.

a) Section 1.0: Presents a brief overview and statement of purpose.

b) Section 2.0: Provides an explanation of the Technical Cooperative Agreement process.

c) Section 3.0: Describes the technical terms of reference.

d) Section 4.0: Describes the financial responsibilities of the parties to this agreement.

e) Appendix A: A list of reference documents used in support of this Agreement.

f) Appendix B: Technical-operational coordination agreement for the establishment of VSAT MEVA II and REDDIG networks interconnection

1.2 **SECTION 1 – PURPOSE**

1.2.1 The goal of this MoU is to foster a coordinated plan for in the development of MEVA II and REDDIG networks and its interconnection implementation.

1.2.2 This MoU is a living document through which members of the MEVA II and REDDIG networks shall convene, as necessary and at locations agreed upon, to review or amend the details of the Agreement. Revised versions of this Agreement, or paragraph changes, shall be coordinated and distributed by the ICAO NACC and SAM Regional Offices to the signatory parties of the Agreement as appropriate.

1.2.3 This MoU document establishes the following coordination and cooperation process:

a) The holding of coordination meetings to analyse and identify the requirements and preferred technical solution(s), alternatives, and options for achieving interconnection of the MEVA II and REDDIG VSAT networks via a common satellite and use of similar equipment.

b) The exchange of technical reports and documentation, program plans and schedules, as may become necessary, to assure the successful and timely completion of these efforts.

c) Operational-technical coordination between the Parties involved in MEVA II and REDDIG networks, as necessary.

d) Planning, technical coordination, and development participating member States/Territories/International Organisations of the MEVA II and REDDIG Networks.

2. **SECTION 2 – THE TECHNICAL COOPERATIVE AGREEMENT PROCESS**

2.1 To reach the goal of this MoU, the MEVA II and REDDIG members have developed an interconnection solution that shall be implemented to operate during an initial five-year phase after finalising the implementation. During this initial phase, the members of these networks shall also define and develop a solution that shall enable the integration of the two networks at a later stage, which will be properly protected in a separate document.

2.2 **RELATIONSHIPS AND RESPONSIBILITIES OF THE PARTIES**

2.2.1 In order to achieve the interconnection of the networks in a timely and mutually beneficial way, the parties to this Agreement recognise the need to coordinate their actions and exchange updated operational-technical information.

2.2.2 The Parties also recognise the need to develop common technical solutions for interconnecting and/or integrating these networks, in a manner that shall not negatively impact the planned operation, performance, or management of the either network.

2.2.3 ICAO NACC and SAM Regional Offices shall convene coordination meetings, as needed.

2.2.4 The Parties of this MoU agree to exchange reports, technical documents, plans and programming that may be necessary in order to guarantee the successful and timely fulfilment of the interconnection of these networks.

2.2.5 The Parties of this MoU agree to implement during the initial phase the MEVA II / REDDIG interconnection solution as presented in Appendix B.

3. SECTION 3 – TECHNICAL TERMS OF REFERENCE

3.1 The interconnection solution's objectives and their technical operational principles are described under the Appendix B of this document.

4. SECTION 4 – FINANCIAL RESPONSIBILITIES OF THE NETWORK PARTIES

4.1 MEVA II / REDDIG members shall, as individual administrations, be responsible for their own financial obligations, in accordance with the Agreement contained in Appendix B.

4.2 The Parties to this Agreement understand that they shall not commit to any action that may result in a financial obligation to other Parties, without first obtaining an Agreement, in writing, from all other parties to this Agreement.

NOTES:

MEVA II - The term "MEVA II", as used in this document, refers to the VSAT network currently providing voice and data aeronautical telecommunications services to States/Territories/International Organisations in the Caribbean Region. The network is managed by Caribbean States/Territories/International Organisations members, through the Technical MEVA Group (TMG), and is coordinated by the ICAO NACC Regional Office.

REDDIG - The term "REDDIG", as used in this document, refers to the VSAT network presently implemented in the South American region under the technical cooperation project RLA/03/901 coordinated by the ICAO Lima Office.

APPENDIX B

TECHNICAL-OPERATIONAL COORDINATION AGREEMENT FOR THE ESTABLISHMENT OF VSAT MEVA II AND REDDIG NETWORKS INTERCONNECTION

1. SECTION 1 – PURPOSE OF THIS AGREEMENT

1.1 PURPOSE

1.1.1 To establish technical, operational and administrative aspects necessary for the digital VSAT MEVA II and REDDIG networks interconnection, to meet aeronautical telecommunications requirements between the CAR/SAM Regions.

2. SECTION 2 – CO-OPERATIONAL TECHNICAL PROCESS OF THE AGREEMENT

2.1 RELATIONSHIP AND RESPONSIBILITIES OF THE PARTIES

2.1.1 During this stage, the management of MEVA II and REDDIG shall continue with their respective service providers, i.e, REDDIG shall continue with its REDDIG Administration, and MEVA II, with the MEVA II Service Provider.

2.1.2 States/Territories/International Organisations members of MEVA II and REDDIG networks shall be responsible for the normal operation of each of their nodes, having to establish mechanisms necessary to ensure the degree of availability required for each of the services under consideration.

3. Section 3 – TECHNICAL TERMS OF REFERENCE

3.1 TECHNICAL TERMS OF REFERENCE

3.1.1 Members of MEVA II and REDDIG networks have mutual interest in establishing the interconnection of their respective communications networks in a manner that they provide the capacity for current and future voice and data aeronautical telecommunications services between the designated nodes within these networks, so as to support aeronautical telecommunications in the CAR/SAM Regions.

3.1.2 The interconnection technical solution shall be carried out under premise that the REDDIG and MEVA II VSAT network is developed under a full mesh network topology, using TDMA/Frame Relay satellite access, as well as a IS 1R satellite transponder with a beam directed over United states / Latin America, C band operation frequencies and co-linear vertical polarisation.

3.1.3 For the interconnection of the additional equipments to be initially installed at each node involved, MODEMs Linkway 2100, as well as any other necessary equipment, shall be acquired.

3.1.4 The interconnection implies the following implementations:

a) Additional equipment at Bogota (Colombia) and Caracas (Venezuela), REDDIG nodes; and

b) Additional equipment at Tegucigalpa, Honduras, COCESNA MEVA II node.

3.2 **MANAGEMENT TERMS OF REFERENCE**

3.2.1 Implementation of the interconnection option shall not involve modifications to the technical, operational and control management of MEVA II and REDDIG networks, with exception of the necessary maintenance coordination procedures detailed in paragraph 3.2.5 of this Attachment.

3.2.2 The configuration, synchronisation, supervision and control of additional MODEMs participating in the interconnection and installed at REDDIG nodes, shall be carried out by the MEVA II Network Control Centre (NCC). Also, the configuration, synchronisation, supervision and control of additional MODEMs participating in the interconnection and installed at MEVA II nodes, shall be carried out by the REDDIG NCC.

3.2.3 The band-width, number and type of circuits installed in the MEVA II node for communications with REDDIG, shall be managed by REDDIG.

3.2.4 The band-width, number and type of circuits installed in the REDDIG node for communications with MEVA II, shall be managed by MEVA II.

3.2.5 **Maintenance coordination procedures between the NCCs**

3.2.5.1 When there is any problem in a REDDIG node, with the MODEM or other equipments involved in the interconnection with MEVA II, the following shall be applied:

a) MEVA II Service Provider shall call the REDDIG Administration informing of the happening;

b) The REDDIG Administration shall phone the respective node and shall establish an audio teleconference between MEVA II Service Provider and Caracas or Bogota local technicians, as necessary;

c) REDDIG NCC, under control of the REDDIG Administration, shall supervise communications between MEVA II Service Provider and REDDIG nodes technicians.

d) The MEVA II Service Provider is the only one that may call the REDDIG Administration to start or close the respective trouble ticket.

3.2.5.2 When there is any problem in a MEVA II node, with the MODEM or other equipment affect the interconnection with REDDIG, the following shall be applied:

a) The REDDIG Administration shall call the MEVA II Service Provider informing of the happening;

b) The MEVA II Service Provider shall call the respective node and shall establish an audio conference between REDDIG Administration and local technicians, as necessary;

c) MEVA II NCC, under control of the Service Provider, shall supervise communications between REDDIG Administration and MEVA II nodes technicians.

d) The REDDIG Administration is the only one that may call the MEVA II Service Provider to start or close the respective trouble ticket.

3.2.6 **Security requirements**

3.2.6.1 The minimum security arrangements required by REDDIG, and that should be followed by the MEVA II, are:

a) MEVA II network have no direct communications with public networks.

b) The equipment is not shared with services different to MEVA II.

c) Access restriction to equipment belonging to the network, through the use of a password.

d) The network must exclusively support services to which it was originally constituted for.

3.2.6.2 The minimum security arrangements required by MEVA II, and that shall be followed by REDDIG, are:

a) REDDIG network have no direct communications with public networks.

b) The equipment is not shared with services different to REDDIG.

c) Access restriction to equipment belonging to the network, through the use of a password.

d) The network must exclusively support services to which it was originally constituted for.

4. SECTION 4 – FINANCIAL RESPONSIBILITIES OF THE PARTIES

4.1 EQUIPMENT PURCHASING

4.1.1 Additional equipment to be installed at REDDIG nodes, with MEVA II MODEMs requirements, can be purchased by the REDDIG members in accordance with the requirements established for the interconnection.

4.1.2 Additional equipment to be installed at MEVA II nodes, with REDDIG MODEMs requirements, can be purchased by MEVA II members (States, Territories, Organisations) to the MEVA II Service Provider, in accordance with the requirements established for the interconnection.

4.2 SPARE PARTS LOT PURCHASING

4.2.1 The spare parts for the additional equipment to be installed at the REDDIG nodes, with MEVA II MODEM and other device requirements, can be purchased by REDDIG, and would form part of the spare parts lot existing in REDDIG.

4.2.2 The spare parts for the additional equipment to be installed at the MEVA II nodes, with REDDIG MODEM and other device requirements, shall be purchased by MEVA II Members.

4.3 MAINTENANCE

4.3.1 The additional equipment that would be installed in the REDDIG nodes and that would route communications requirements with MEVA II nodes, shall be maintained by the respective REDDIG member States, under the coordination of the REDDIG Administration.

4.3.2 The additional equipment that would be installed in the MEVA II node, with communications requirements with REDDIG nodes, shall be maintained by MEVA II Member, in coordination with the MEVA II Service Provider.

4.4 SPACE SEGMENT

4.4.1 The carriers, as well as the band width requirement for communications between REDDIG nodes shall be the same as those currently rented with INTELSAT. The payment of the space segment to INTELSAT shall continue being carried out through the REDDIG Administration, who shall be in charge of collecting contributions from each SAM State member of REDDIG.

4.4.2 The carriers, as well as the band width requirement for communications between MEVA II nodes shall be done through the MEVA II Service Provider. MEVA II members shall pay the bandwidth consumption to the MEVA II Service Provider.

4.4.3 The circuits necessary for communications between a REDDIG node having MODEMs participating in the interconnection with MEVA II shall be administrated by the MEVA II Service Provider. The amount charged for circuits used by the REDDIG Member of the aforementioned node mentioned shall be provided by the MEVA II Service Provider, and the respective consumption payment to the provider shall be made through REDDIG Administration.

4.4.4 The circuits necessary for communications between a MEVA II node having MODEMs participating in the interconnection with REDDIG shall be administrated by REDDIG. The amount charged for circuits used by the mentioned node shall be provided by the REDDIG Administration, and the respective consumption payment shall be made by the MEVA II member of the aforementioned node to the REDDIG Administration.

- END -

Agenda Item 3: Update on the Action Plan for MEVA II/REDDIG Interconnection Implementation

3.1 The Meeting recalled that the Fourth MEVA II / REDDIG Coordination Meeting (MR/4) held in Lima, Peru, from 7 to 9 March 2007, keeping in mind the CNS Committee recommendation, prepared an action plan for the interconnection implementation of the MEVA II and REDDIG VSAT digital networks. This action plan was reviewed and amended by GREPECAS through Conclusion 14/52, which urged States/Territories/International Organisation members of these networks to approve and carry out the corresponding tasks of the action plan.

3.2 When analysing the progress of execution of the action plan for the MEVA II / REDDIG interconnection implementation, the RFP process regarding the review of the MoU by the MEVA II / REDDIG members, and the replies to the RFP by the MEVA II Service Provider and the REDDIG Administration, the draft action plan for the VSAT MEVA II / REDDIG network interconnection implementation was updated. This document is included in **Appendix 3A** to this part of the Report.

3.3 In order to carry out the implementation activities foreseen in the action plan in a coordinated manner, the Meeting agreed that the parties involved in the execution of this Plan should name a point-of-contact to coordinate the activities related to the MEVA II / REDDIG interconnection with the MEVA II Service Provider and the REDDIG Administration.

3.4 The Meeting considered that many of the activities proposed in the action plan could be executed simultaneously on behalf of the MEVA II and REDDIG members. Among these activities are the review and approval of the Technical-Economical Proposal, the review and approval of the MoU as a consequence of the amendments made to the document, as well as the review and approval of the contracts that will allow the acquisition and implementation of the equipment for the interconnection.

3.5 With the purpose of allowing the REDDIG Administration to proceed with the analysis to agree on a contract with the MEVA II Service Provider, the Meeting requested the Provider to submit a contract for analysis. Regarding this issue, the Meeting considered including an activity related to the signing of the contract on behalf of States, Territories and International Organization involved in the MEVA II / REDDIG interconnection with the MEVA II Service Provider or with the REDDIG Administration within the proposed action plan. The Meeting agreed that this activity should take place before 30 November 2007.

3.6 The Meeting urged the members of the MEVA II and REDDIG Networks, the MEVA II Service Provider and the REDDIG Administration to proceed with the implementation of the established actions on the scheduled dates in order to achieve interconnection implementation in May 2008.

3.7 As a result of the analysis of this agenda item, the Meeting drafted the following Conclusions:

CONCLUSION MR/5/4 ADOPTION OF THE UPDATED ACTION PLAN FOR THE MEVA II / REDDIG INTERCONNECTION IMPLEMENTATION

That MEVA II and REDDIG member States/Territories/International Organisation, as well as the MEVA II Service Provider and the REDDIG Administration:

a) implement the updated action plan for the MEVA II / REDDIG interconnection implementation, which is presented in Appendix 3A to this part of the Report; and

b) nominate and inform the corresponding ICAO Regional Office, no later than **31 October 2007**, of their respective point-of-contact to coordinate the implementation of the plan mentioned in a) above.

CONCLUSION MR/5/5 REQUEST FOR A CONTRACT PROPOSAL BETWEEN THE MEVA II SERVICE PROVIDER AND THE REDDIG ADMINISTRATION

That, in order to proceed with arranging a contract between the MEVA II Service Provider and the REDDIG Administration for the implementation of technical/economical requirements relevant to the MEVA II / REDDIG interconnection, the MEVA II Service Provider provide a contract proposal before **26 October 2007**.

UPDATED ACTION PLAN FOR IMPLEMENTATION OF MEVA II AND REDDIG INTERCONNECTIONS
PLAN DE ACCIÓN ACTUALIZADO PARA LA IMPLANTACIÓN DE LAS INTERCONEXIONES MEVA II Y REDDIG

Date/Fecha: October/Octubre 2007

Item No.	Action / Acción	Responsible / Responsable	Completion Date / Fecha de Finalización	Status- Encountered Difficulties / Estado-Dificultades encontradas
1	2	3	4	5
1	RFP Completion/Finalización del RFP	COCESNA	30-Apr-07	Completed / Finalizado
2	Required connections: / Conexiones requeridas: Aruba COCESNA Ecuador Colombia Peru Venezuela Brazil / Brasil Panama United States / Estados Unidos Jamaica Curacao / Curazao	MEVA II Service Provider and REDDIG Administration / Proveedor Servicio MEVA II y Administración REDDIG	30-Apr-07 / 30-Abr-07	Completed / Finalizado
3	Identification of Current Equipment / Identificación de Equipo Actual	MEVA II Service Provider and REDDIG Administration / Proveedor Servicio MEVA II y Administración REDDIG	28 Sep-07	Completed / Finalizado
4	Completion of SLA / Finalización de SLA	MEVA II Service Provider and REDDIG Administrator / Proveedor Servicio MEVA II y Administración REDDIG	30 Nov07	
5	Review of RFP / Revisión de RFP	MEVA II and REDDIG Members / Miembros MEVA II y REDDIG	29 June -07/ 29 Junio 07	The RFP was reviewed and approved by all MEVA II / REDDIG Member Administrations. / El RFP fue revisado y aprobado por todas las Administraciones miembros de las redes MEVA II y REDDIG.

Item No.	Action / Acción		Responsible / Responsable	Completion Date / Fecha de Finalización	Status- Encountered Difficulties / Estado-Dificultades encontradas
1	2		3	4	5
6	Proposals response / Respuesta de propuestas		MEVA II Service Provider and REDDIG Administration / Proveedor Servicio MEVA II y Administración REDDIG	26 Sep.-07	The response for the RFP from the MEVA II Service Provider and REDDIG Administration is presented at this MR/5 Meeting/ Las respuestas al RFP por parte del Proveedor de Servicio MEVA II y la Administración de la REDDIG se presentan en esta Reunión MR/5.
7	Proposals review / Revisión de propuestas		Coordination meeting / Reunión de coordinación	5 Oct.-07	The proposal was reviewed in the MR/5 Meeting. / La propuesta se revisó en la Reunión MR/5
8	Focal Point nomination / Nombramiento Punto Focal	Send a letter to MEVA II / REDDIG Member Administrations / Envio carta a las Administraciones miembros de las redes MEVA II y REDDIG.	ICAO Regional Offices / Oficinas Regionales OACI	15 Oct. 07	
		Focal point designation/ Designación punto focal	MEVA II and REDDIG Members involved / Miembros de MEVA II y REDDIG involucrados	30-Oct-07	
9	Application of MoU reviewed / Aplicación del MoU revisado		MEVA II / REDDIG Member Administrations / Administraciones miembros de las redes MEVA II y REDDIG	30-Oct-07	
10	Review and acceptance of equipment costs for the MEVA II / REDDIG interconnection by the REDDIG Member Administrations / Revisión y aceptación por parte de las Administraciones Miembros de la REDDIG sobre costo de equipamiento para la interconexión MEVA II / REDDIG		All the REDDIG Member States / Todos Estados miembros de REDDIG	30 Oct-07	

Item No.	Action / Acción	Responsible / Responsable	Completion Date / Fecha de Finalización	Status- Encountered Difficulties / Estado-Dificultades encontradas
1	2	3	4	5
11	Review and acceptance of equipment costs for the MEVA II / REDDIG interconnection by the MEVA II Member Administrations involved / Revisión y aceptación por parte de las Administraciones Miembros de la MEVA II involucradas sobre costo de equipamiento para la interconexión MEVA II / REDDIG	Aruba, Curaçao, Jamaica, Panama, USA (Miami and Puerto Rico) and COCESNA / Aruba, Curaçao, Jamaica Panamá, USA (Miami y Puerto Rico) y COCESNA	30 Oct -07	
12	Review and acceptance of proposed recurrent costs for the MEVA II / REDDIG interconnection/ Revisión y aprobación costos recurrentes propuestos para la interconexión MEVA II REDDIG	MEVA II/ REDDIG Member Administrations involved / Administraciones Miembros de la MEVA II y REDDIG involucradas	30 Oct- 07	
13	Revised MoU Signature / Firma del MoU Revisado	MEVA II and REDDIG Members / Miembros MEVA II y REDDIG	30 Nov 07	
14	Review, approval and signing of contracts or contract amendments to carry out the MEVA II / REDDIG interconnection presented by the MEVA II Service Provider / Revisión, aprobación y firma de los contratos o enmienda de los mismos para llevar a cabo la interconexión MEVA II/REDDIG presentada a través del Proveedor de Servicio de la MEVA II	MEVA II Member Administrations involved and REDDIG Administration / Administraciones Miembros de la MEVA II involucradas y Administración REDDIG	30 Nov 07	
15	To ensure that all MEVA II and REDDIG nodes work with IS-IR Satellite, using Band C transponder with US/Latin America hemispheric beam and Co-Linear Vertical polarization / Asegurar que todos los nodos de la MEVA II y REDDIG operen en el satélite IS-1R, empleando transpondedores de banda C con haz hemisférico US/Latin America y polarización co-lineal vertical.	MEVA II Service Provider and REDDIG Administration/ Proveedor Servicio MEVA II/Administración REDDIG	30 Nov-07	

Item No.	Action / Acción	Responsible / Responsable	Completion Date / Fecha de Finalización	Status- Encountered Difficulties / Estado-Dificultades encontradas
1	2	3	4	5
16	Equipment and spare parts acquisition for MEVA II/REDDIG interconnection/ Adquisición de equipamiento y repuestos para la interconexión MEVA II / REDDIG.	REDDIG Administration and MEVA II involved Member Administrations / Administración de la REDDIG y Administraciones Miembros de la MEVA II involucradas	14 Dec 07/14 Dic 07	
17	Site survey/ Inspección sitio	MEVA II Service Provider and REDDIG Administration / Proveedor MEVA II y Administración REDDIG	15 –Jan-08/15-Ene-08	
18	Site preparation for equipment installation for MEVA II / REDDIG interconnection / Preparación de los sitios para albergar equipamiento para la interconexión MEVA II / REDDIG	Colombia, Venezuela and/y COCESNA	30 –Jan-08/30-Ene-08	
19	Delivery of purchased equipment at the required sites. / Entrega de equipamiento adquirido en los sitios requeridos	MEVA II Service Provider and REDDIG Administration / Proveedor de Servicio MEVA II y Administración REDDIG	15-Feb-08	
20	Equipment installation / Instalación equipamiento /	MEVA II Service Provider and REDDIG Administration / Proveedor de Servicio MEVA II y Administración REDDIG	14 Mar- 08	
21	Satellite line-up, configuration of site equipment and NCC for the interconnection/ Line-up satelital, configuración equipamiento en sitio y NCC para interconexión	MEVA II Service Provider and REDDIG Administration / Proveedor de Servicio MEVA II y Administración REDDIG	21-Mar-08	
22	End-to-end trials for voice and data circuits / Pruebas de extremos a extremos para los circuitos de voz y datos	MEVAII Service Provider and REDDIG Administration / Proveedor de Servicio MEVA II y Administración REDDIG	27-Mar-08	
23	System Performance Evaluation / Evaluación de la performance del sistema	MEVA II Service Provider and REDDIG Administration / Proveedor de Servicio MEVA II y Administración REDDIG	25-Apr-08/25-Abr-08	

Item No.	Action / Acción	Responsible / Responsable	Completion Date / Fecha de Finalización	Status- Encountered Difficulties / Estado-Dificultades encontradas
1	2	3	4	5
24	Service acceptance / Aceptación de los servicios /	MEVA II / REDDIG Member Administrations / Administraciones miembros de las redes MEVA II y REDDIG	30-Apr-08/30-Abr-08	
25	MEVA II / REDDIG Interconnection Implementation / Implantación de la interconexión MEVA II / REDDIG	MEVA II / REDDIG Member Administrations, MEVA II Service Provider and REDDIG Administrator / Administraciones miembros de las redes MEVA II y REDDIG, Proveedor Servicio MEVA II y Administración REDDIG	May 08/ Mayo 08	

Legend / Leyenda:
MoU: Memorandum of Understanding / Memorando de Entendimiento
RFP: Request for Tecnical and Econmic Proposal / Solicitud de Propuestas Técnicas y Económicas
SLA: Service Level Agreement / Acuerdo de Nivel de Servicio

Agenda Item 4: Other Matters

Presentation on the MEVA II / REDDIG Interconnection Process Status for the GREPECAS Mechanism –2008 Cycle

4.1 The Meeting agreed that the Secretariat, with the support of the MEVA II / REDDIG Task Force, prepare and present the GREPECAS mechanism during the 2008 cycle, the necessary documentation on the interconnection process status of the MEVA II / REDDIG VSAT Networks.

4.2 Additionally, the Meeting agreed that all parties involved should make their best effort in order to accomplish the interconnection implementation as soon as possible, thus providing the GREPECAS mechanism with the implementation accomplishments during the 2008 cycle. This will provide multiple associated benefits for civil aviation and the CAR/SAM Regions States/Territories/International Organisations.

Commencement of Studies for the MEVA II / REDDIG Integration

4.3 Likewise, the Meeting considered that in the forthcoming MEVA II / REDDIG Coordination Meetings, the necessary studies for the integration phase will commence.

Next MEVA II / REDDIG Coordination Meeting

4.4 The Meeting agreed that the next MEVA II / REDDIG Coordination Meeting (MR/6) be tentatively scheduled for April 2008, in the ICAO SAM Regional Office in Lima, Peru.