International Civil Aviation Organization
Fifth MEVA II / REDDIG Coordination Meeting (MR/5)
Mexico City, Mexico, 3 to 5 October 2007

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

REPLY FROM THE REDDIG ADMINISTRATION TO THE MEVA II / REDDIG RFP

(Presented by the REDDIG Administration)

SUMMARY

This working paper presents the technical and economical proposal from the REDDIG Administration for the interconnection of MEVA II / REDDIG in the COCESNA MEVA II node.

1. Background

1.1 During the third MEVA II / REDDIG coordination meeting (MR/3) (Mexico City, 26 to 28 July 2006) Conclusion 3/1 – *Technical-operational analysis for the MEVA II / REDDIG interconnection solution* was formulated, which specified that the most viable solution, as an initial stage for MEVA II / REDDIG interconnection, would mainly consist in the implementation of the MEVA II modem in Colombia and Venezuela, and a REDDIG MODEM in COCESNA.

1.2 MEVA II / REDDIG interconnection will increase the availability of the current aeronautical fixed services (ATS speech circuits, AFTN), its transmission capacity and speed. In addition, it will permit the implementation of other future applications, such as radar data exchange and initial ATN ground applications (AMHS and AIDC) among CAR/SAM States, Territories and Organizations.

1.3 MEVA II / REDDIG interconnection represents the initial stage to meet communications requirements between the CAR and SAM Regions. After a five-year period, as of the date of implementation of MEVA II / REDDIG interconnection, MEVA II / REDDIG networks integration would start, so as to have only one VSAT network controlled by only one network management centre.

1.4 During the fourth MEVA II / REDDIG coordination meeting (MR/4) (Lima, Peru, 7 to 9 March 2007) Decision 4/1 – *Elaboration of an RFP for MEVA II / REDDIG interconnection* was formulated, with the aim that the MEVA II / REDDIG Interconnection Task Force, under coordination with COCESNA, complete the elaboration of the request for a technical and economical Proposal Request (RFP) for MEVA II / REDDIG interconnection to be presented to the MEVA II Service Provider and the REDDIG Administration.

1.5 Also, MR/4 formulated Conclusions 4/2 – *Approval and response to the MEVA II / REDDIG RFP* and 4/4 – *Adoption of the action plan for MEVA II / REDDIG interconnection,* which indicated the implementation dates of the various stages for MEVA II / REDDIG interconnection.

2. Analysis

2.1 The REDDIG Administration, once it had received the RFP, elaborated the technical-economical proposal for the operation of the COCESNA node in the REDDIG network. Copy of the proposal is presented in the **Appendix** to this paper.

2.2 The technical proposal presented includes the premises for the operation of the COCESNA node in REDDIG, the design for the solution and the services offered. The economical proposal includes implementation and operation services costs.

2.3 The technical solution presented takes into consideration the maximum use of the equipment currently available in the COCESNA/MEVA II node to optimize investment costs. 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.

2.4 In the economical proposal, the equipment costs presented are those provided by the manufacturing companies to REDDIG Administration. The recurrent costs were obtained on the basis of administrative costs necessary for REDDIG management, as well as the proportionate costs over the leased satellite segment.

3. Action recommended

3.1 The Meeting is invited to:

a) Take note of the information provided;

b) Analyze the proposal presented by the REDDIG administration for MEVA II / REDDIG interconnection at the COCESNA node, presented as Appendix to this paper; and

c) Analyze any other action in this regard that the Meeting might consider necessary.

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APPENDIX

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

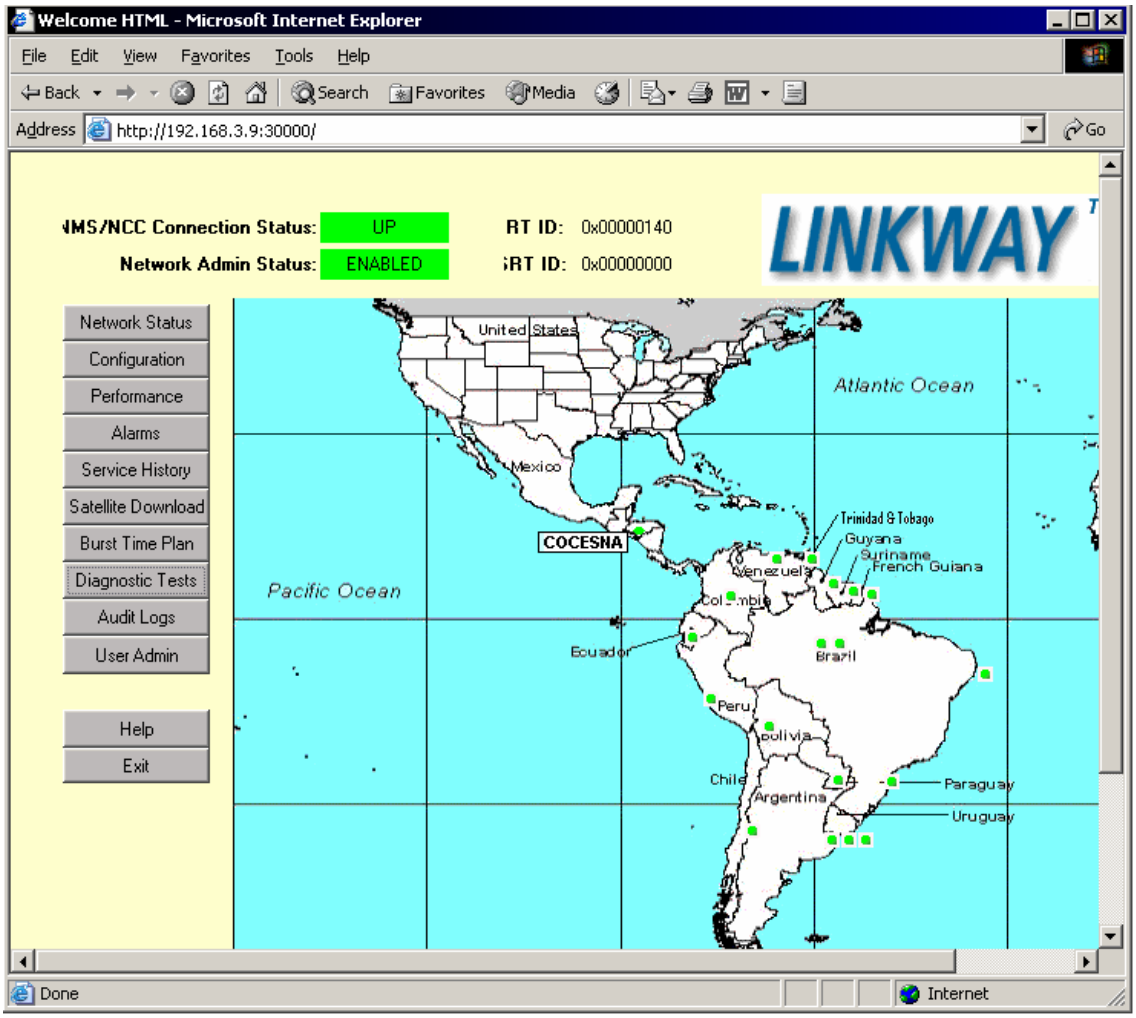
1. **PRESENTATION**

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 Resultados obtained 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

Analysis of the power consumption in the COCESNA node transmitter

2.4.1.5 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
(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

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
- equipment installation
- satellite line up and link tests

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

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

4. TERMS AND CONDICIONS

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 Garantía del equipamiento

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.