International Civil Aviation Organization
Seventh MEVA II / REDDIG Coordination Meeting (MR/7)
Mexico City, Mexico, 10 to 11 June 2009

Agenda Item 4: Initial Considerations Study on the implementation of the MEVA II / REDDIG networks integration

PRELIMINARY STUDY ON INITIAL CONSIDERATIONS FOR THE IMPLEMENTATION OF MEVA II / REDDIG NETWORKS INTEGRATION

(Presented by the Secretariat)

SUMMARY

This working paper presents a preliminary study on initial considerations for the implementation of MEVA II / REDDIG networks integration, based on the lessons learned from the interconnection process of both networks.

References:

- MEVA II REDDIG Coordination Meeting Reports
- GREPECAS/15 Report

1 Background

1.1 The previous MEVA II/REDDIG Coordination meetings and the MEVA II REDDIG Interconnection Working Group Meeting have analyzed aspects for the homogeneous integration of the MEVA II and REDDIG networks, achieving several agreements and initial considerations relevant for determining the continuity of this analysis.

1.2 The GREPECAS/14 Meeting approved the conclusion of the Third MEVA II / REDDIG Coordination Meeting (MR/3) *Conclusion 3/1 "Technical Operational Analysis for the MEVA II / REDDIG interconnection solution"* where the complete or homogeneous total integration represented the best operational technical solution, in view that this will allow having a single control, facilitating management, as well as the implementation of required services between the CAR and SAM Regions. Nevertheless, it was determined that the integral solution implementation as first stage would be difficult to accomplish considering existing diverging aspects in the operation and administration of the REDDIG and MEVA II. In this regard, the most feasible solution in the initial stage would be interconnection, aimed at integrating the networks after a five year period.

2. Discussion

2.1 Regarding conclusion MR 06/05 of the Sixth MEVA II / REDDIG Coordination Meeting "Study about the initial considerations for the implementation of the MEVA II and REDDIG networks integration", ICAO compiled the initial considerations for both networks integration and prepared a preliminary study on the technical configuration of an integrated network, and the services that will initially be supported, which is presented in the **Appendix** to this working paper.

2.2 It is considered that in this moment, initial considerations achieved through the MEVA II / REDDIG coordination and working group meetings, related to operational, administrative and institutional aspect are very premature, if it is taken into account that the MEVA II/REDDIG networks interconnection is still not implemented and there is no operational experience.

2.3 It should be highlighted that the analysis and initial evaluation carried out by the MEVA II/REDDIG coordination and working group meetings have determined implementation viability of MEVA II/REDDIG networks integration, and therefore, it is reasonable to continue studying in depth the aspects and initial considerations, including actions planning and similar works to this objective. These plans should be contemplated and finished within the five year period once the MEVA II and REDDIG networks interconnection is implemented and in operation

2.4 In this regard, aspects and considerations to study in depth should be:

- Present and future networks requirements.
- Review networks operational conditions and aspects in respect of satellite providers.
- Review of service Agreements to be offer in the networks.
- Cost/benefit analysis: review of tariffs, prices and cost of alternative means of service.
- Institutional implications and progress in creating a multinational organization (OMR) to manage the integrated network, including costs and operational conditions, such as:
  - REDDIG management change from an ICAO technical cooperation project to a Regional Multinational Organization (RMO).
  - MEVA II management change to a Regional Multinational Organization.
- Assessment of management, maintenance and networks operation procedures, in case they differ from initial considerations.
- Assessment of legal and administrative implications for achieving the integration, as for example the Memorandum of Understanding (MoU).
- Assessment of technology and equipment changes that could suffer the networks.

2.5 Considering that some aspects and considerations to study in-depth are elements and topics typical of the networks operation and management, in-depth and completion of these elements should be assigned as a task within each one of the MEVA II and REDDIG managing groups, within the five year period.

3 Suggested action

3.1 The Meeting is invited to :

a) take note of the information presented in this working paper;
b) review the preliminary study on the configuration and services of an integrated network presented in the Appendix to this note;
c) prepare an action plan within the five year period to in-depth this study in accordance with comments in paragraphs 2.2 to 2.4;
d) recommend that works mentioned in paragraphs 2.2 and 2.4 be considered within the Work Programmes of the administrative groups for each network, as mentioned in paragraph 2.5; and
e) suggest and analyze other considerations, as deemed necessary by the meeting.

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APPENDIX

PRELIMINARY STUDY ON INITIAL TECHNICAL CONSIDERATIONS FOR THE IMPLEMENTATION OF THE MEVA II / REDDIG NETWORKS INTEGRATION

Background and References for Digital Networks Integration

The Third Regional Air Navigation Caribbean and South America Meeting (RAN CAR/SAM/3) (Buenos Aires from October 5th to 15 of 1999) alert GREPECAS the need to develop criterions and pertinent orientation in order to obtain the interconnection among several available and emerging digital networks. Recommendation 9/1 – *Implementation of digital networks to improve the current AFS and to facilitate the introduction of the ATN*.

In order to set up criteria for digital networks interconnection in a regional an interregional level, two informal meetings: CAR/SAM Informal Meeting 01/00 (Mexico, from June 26 to 29, 2000) and CNS-CAR/SAM Informal Meeting 01/01 (Bogota, Colombia, from October 9 to 11, 2001) were held, as well as MEVA and REDDIG networks Interconnection Coordination Meeting (Lima, from November 11 to 12, 2002). In these meetings several proposals of interconnection alternatives were displayed, including the adoption of an memorandum of understanding for the establishment of an homogeneous digital platform based in MEVA II and REDDIG networks interconnection, as well as the transitory implementation of Colombian network nodes in Jamaica, Panama and COCESNA; it was agreed that these measures be applied until the MEVA II / REDDIG interconnection is achieved.

The GREPECAS/10 Meeting (Las Palmas, Spain, October 23 to 27, 2001) adopted a preliminary orientation material referred to digital networks interconnection for aeronautic communications (Conclusion 10/27). Also, the Conclusion 10/28 indicates the need of capacity provision of massive information exchange through aeronautic communications digital networks.

The GREPECAS/12 Meeting (La Habana, Cuba, June 7 to 11, 2004) highlighted the importance to continue efforts in order to achieve interconnection and homogeneous interoperability among CAR/SAM regional digital networks, considering present and future communication requirements of voice and data and, in this sense, formulated Conclusion 12/39 – *Additional inter-connection points for regional and inter-regional digital networks*.

The GREPECAS/13 Meeting, based in the recommendation of CNS/COMM/4 Meeting, considered:

- the need to continue interconnection/interoperability efforts between two networks, using, in this respect, the coordination meetings of ICAO Technical Cooperation Projects, related with MEVA II y la REDDIG.
- research alternatives, such as implementation of an homogeneous type interconnection or the establishment of interconnection points for a non-homogeneous solution.
- it is important to achieve the purpose of interconnection/inter-performance between MEVA II and REDDIG and consequently, Conclusion 13/70 (*Establishment of Agreements to achieve the MEVA II – REDDIG interconnection/interoperation*) was formulated.

The Fifth Meeting of the ALLPIRG/Advisory Group (ALLPIRG/5), held in ICAO Headquarters, Montreal, Canada, 23 to 24 March 2006, among issues related to VSAT networks implementation, formulated Conclusion 5/16 – Implementation of very small aperture terminals (VSATs), which discourage proliferation of VSAT networks where one/some of the existing ones can be expanded to serve new areas of interest.

Considerations and Initial Operational Technical Aspects for the Integration

Under this networks integration concept, VSAT MEVA II and REDDIG networks interoperability will be allowed in a homogeneous way, as if only one VSAT network exist without the need to implement other communication means for interconnection.

Interoperability is possible since the technical characteristic of both (MEVA II and REDDIG) are similar: network topology type Full Mesh, using TDMA/Frame Relay typical satellite access modality, IS 1R satellite with beam addressed over the United States / Latin America, band C and vertical lineal polarization operation frequency. In the same way, both network use similar and compatible equipment, such as those corresponding to FRAD and satellite MODEM.

One of the fundamental parameters for establishing a homogeneous MEVA II – REDDIG network is synchronization of MEVA II and REDDIG carriers. This synchronization could be carried out with the MRT (Master Reference Terminal, located in the Viasat Linkway MODEM) of the REDDIG NCC or the MEVA II NCC.

Due to the MRT importance and in order to avoid collapsing the network when this fails, it is necessary to have an alternate MRT, as presently in the REDDIG. When a MRT fails, the NCC will use the alternate to maintain the network synchronism. This change will be automatic and transparent for the network users. The principal and alternate MRT should be geographically separated and joined in a direct way through a communications mean. For the MEVA II – REDDIG integration, the REDDIG MRT (operating in Manaus) and the MEVA II MRT could be considered.

The MEVA II and REDDIG networks, being integrated in the same transponder, could operate with different groups of nodes or users according to the traffic between them and to respective frequencies being used. In this way, a group with all the REDDIG nodes and other with all the MEVA II nodes could be established, as well as a last group including REDDIG and MEVA II nodes requiring voice and data service between them. This third users group would be conformed by the nodes of Colombia, Ecuador and Venezuela (REDDIG), and Aruba, Curacao, Panamá, Jamaica, Puerto Rico and COCESNA (MEVA II). Only one reference carrier (MRT) would be used for the synchronization of the homogeneous network.

In the same way, the following particular premises could be identified:

a) Network Management Centre
   - Equipment redundancy with hemispherical geographical diversity.
   - Use of the MRT and AMRT with geographical diversity to avoid solar interference
   - Dedicate circuit between MRT and AMRT.
   - Operation of the Network Management Centre during 24x7x365 in English, Spanish and Portuguese languages.
   - Use of carriers up to 1.25 Msps with QPSK and FEC ½. modulation.
   - Conformation of three groups of users NAM-CAR, SAM and NAM-CAR /SAM.
   - Minimum availability: 99.95%.
   - The network is exclusive and closed for member States and should not be interconnected to any Public Network.

b) Remote Nodes
   - Redundant equipment desirable.
   - Minimum availability: 99.95%.
   - BER equal or above 10^{-6}.

Present communications requirements identified for integration between the SAM Region and CAR Region and the SAM Region and NAM Region.

Within the networks integration, initially the voice and data communications requirements between the SAM and CAR Regions (presented in table 1) have been considered, as well as data requirements between the SAM and NAM regions (presented in table 2).

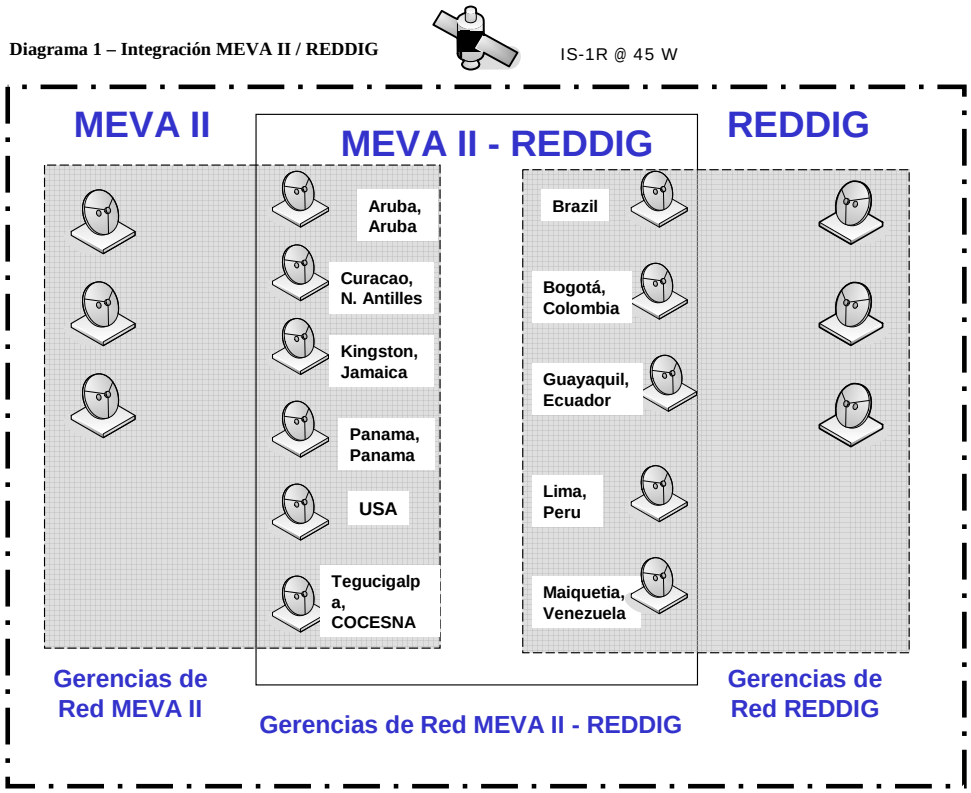
Table No. 1 – Summary of CAR/SAM interoperability requirements

No.	State/Station	**ARUBA,** Aruba	**COLOMBIA**	Barranquilla	Bogota	Cali	Medellín	San Andrés	**ECUADOR**, Guayaquil	**JAMAICA**, Kingston	**NETHERLANDS A.** Curacao	**PANAMÁ**, Panamá	**PUERTO RICO**, San Juan	**VENEZUELA**	Caracas	Josefa Camejo	**COCESNA**, Tegucigalpa	**Total per State**
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	**ARUBA**, Aruba															V		**1 Voice**
2	**COLOMBIA**																	**8 Voice + 1 Data**
2.1	Barranquilla									V	V	V						
2.2	Bogotá											D,V					V	
2.3	Cali											V						
2.4	Medellín											V						
2.5	San Andrés											V						
3	**ECUADOR**, Guayaquil																V	**1 Voice**
4	**JAMAICA**, Kingston			V														**1 Voice**
5	**NETHERLANDS A.** Curacao			V											D,V			**2 Voice + 1 Data**
6	**PANAMÁ**, Panamá			V	D,V	V	V	V										**5 Voice + 1 Data**
7	**PUERTO RICO**, San Juan														D,V			**1 Voice + 1 Data**
8	**VENEZUELA**																	**3 Voice + 2 Data**
8.1	Caracas										D,V		D,V					
8.2	Josefa Camejo	V																
9	**COCESNA**, Tegucigalpa				V				V									**2 Voice**
	Total per Station	1 Voice		3 Voice	2 Voice + 1 Data	1 Voice	1 Voice	1 Voice	1 Voice	1 Voice	2 Voice + 1 Data	5 Voice + 1 Data	1 Voice + 1 Data		2 Voice + 2 Data	1 Voice	2 Voice	

***Note**: Additionally to requirements expressed in Table No. 1, ATN routers interconnection should be added, as well as new services for the radar data Exchange and other communications services, all of which is in process of revision an definition. .*

Table No. 2 – Summary of NAM/SAM interoperability requirements		
No.	**Communications services**	**Type**
1	2	3
1	Mian AFTN circuit **BRASIL**, Brasilia – **UNITED STATES**	Data
2	Main AFTN circuit **PERU**, Lima – **UNITED STATES**	Data
3	Main AFTN circuit **VENEZUELA**, Caracas – **UNITED STATES**	Data
4	ATN routers interconnection No. 1 (Plan under review)	Data
5	ATN routers interconnection No. 2 (Plan under review)	Data
6	Other future services	Data

Initial architecture proposed by the MEVA II / REDDIG Coordination meetings for integration of both networks and their suggested operation:



Note: The interrupted dark line represents a total network operator

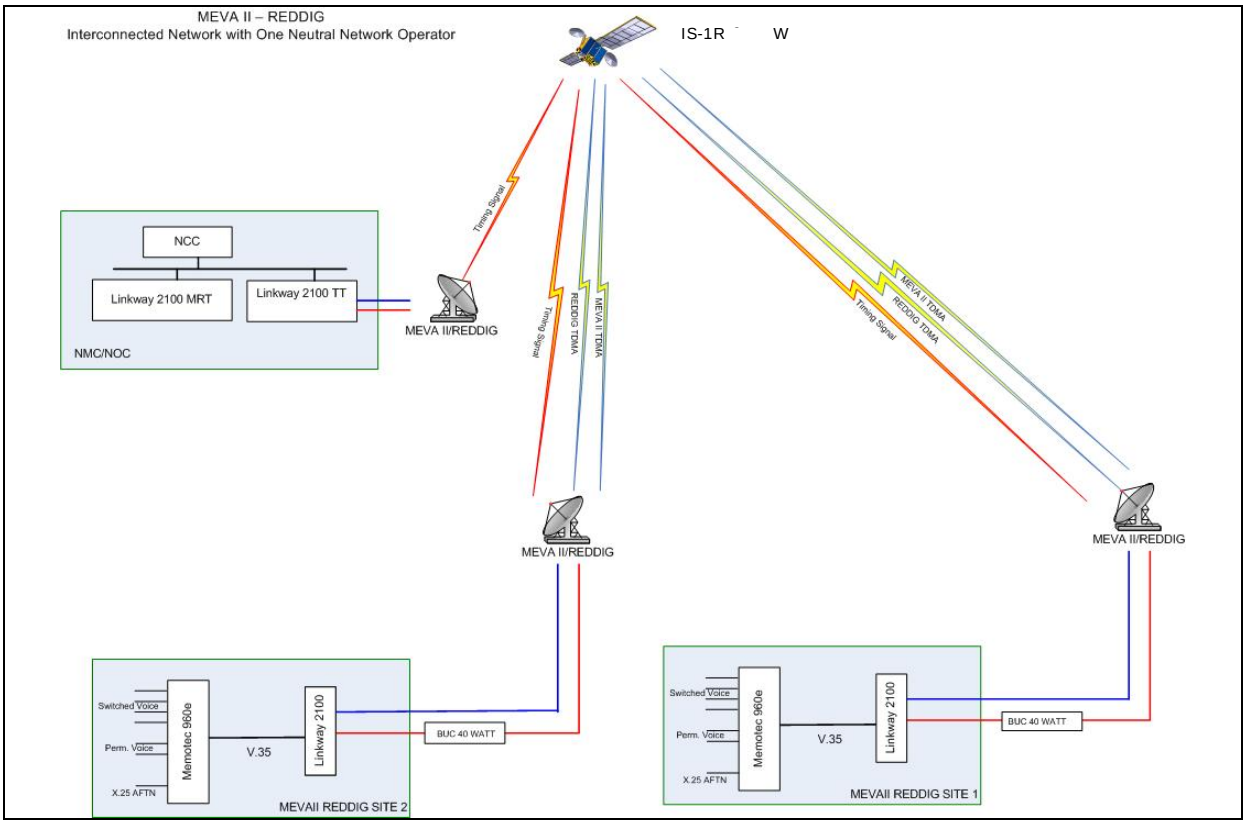


Diagram 2 – MEVA II – REDDIG Networks Interconnected with only one Network Operator

CONCLUSION:

Taking into account these initial considerations on operational technical aspects for the MEVA II and REDDIG networks integration, failing to study in-depth operational, administrative and institutional aspects, as well as review other considerations from the experience in operating both networks interconnection, it could be concluded that both networks integration is technically feasible and among the principal advantages that could be achieved are:

- For any communication between any of the MEVA II and REDDIG nodes only one satellite hop will be used keeping at minimum the delay in voice and data communications.
- Independent and transparent operation for users of groups without interconnection, there should not be interference on those groups traffic.
- Being a homogeneous network in technology and equipments, interconnection and interoperability among MEVA II and REDDIG would be carried out without mayor additional investments in principal equipments or stations.
- Flexibility to increase new interconnection users in any of the networks
- Fulfills interoperability principles of regional digital networks
- Facilitates implementation of ATN applications.

— END —