



Agenda Item 3: Communications, navigation and surveillance (CNS) (By CNS Working Group)

Follow-up to the Implementation of REDDIG II

(Presented by the Secretariat)

SUMMARY	
This working paper presents information on the status of implementation of the new IP-based digital network, REDDIG II.	
References:	
<ul style="list-style-type: none">• Technical-Operational Meeting for the Implementation of the new REDDIG II Digital Network (Lima, Peru, 9-13 September 2013);• Second Technical-Operational Meeting for the Implementation of the new South American Digital Network (Lima, Peru, 26-28 March 2014).	
<i>ICAO Strategic Objectives:</i>	<i>A - Safety; and B - Air navigation capacity and efficiency</i>

1. Introduction

1.1 With the commissioning of the new South American communication network, the Region will have a modern IP-based digital network. The new digital network (REDDIG II) will consist of two networks: a main network based on VSAT stations, which uses the same bandwidth as the REDDIG but whose equipment makes more efficient use thereof; and a ground network based on MPLS (multiprotocol label switching) technology, running on fiber optics, which will initially serve as backup to the satellite network, thus increasing network availability. **Appendix A** to this working paper presents the description of the REDDIG II.

1.2 The REDDIG II will be able to support the existing services as well as the new ones contemplated in the *SAM Performance-Based Air Navigation Implementation Plan (PBIP)*. The new services will be part of the requirements foreseen for the modules of ASBU (Aviation System Block Upgrades) Blocks 0 and 1, mainly related to the global interoperability of systems and data through globally interoperable system-wide information management (Performance Improvement Area 2 - PIA 2).

1.3 Likewise, REDDIG II will be able to support the initial and future regional ATFM requirements, initially through an IP communication sub-network enabling teleconferencing between the various ATFM units of the Region.

2. Discussion

2.1 The implementation of the new REDDIG II started on 21 December 2012 under the terms established in Contract No. 22501200 signed between the INEO & Level 3 Consortium and ICAO, on behalf of all REDDIG member States, for the implementation of the new South American digital network, the REDDIG II. The installation and commissioning of the REDDIG is foreseen for the beginning of the last quarter of 2014.

Activities completed

2.2 The INEO & Level 3 Consortium has already purchased the equipment for REDDIG II; an in-factory course has been conducted (Vélizy, France, 21 April to 9 May 2014) for the personnel of the Manaus and Ezeiza nodes, the REDDIG II main and alternate management centres that will be responsible for REDDIG II management; in-factory acceptance tests have been conducted (Vélizy, France, 12 to 16 May 2014) with the participation of four representatives of REDDIG member States and two representatives of the REDDIG administration; and initial coordination has been completed to expedite customs clearance of the equipment in each of the REDDIG member States.

Activities underway

2.3 The delivery of REDDIG II equipment to each node is foreseen for mid-July 2014. Four sessions of the theoretical-practical course on the REDDIG II will be held in Rio de Janeiro, Brazil, from 11 August to 5 September, to train forty participants who will be responsible for the operation and maintenance of REDDIG II. The installation of all VSAT nodes of the satellite network and of the MPLS ground network that will make up the new REDDIG II will begin in mid-September 2014. The commissioning of REDDIG II is foreseen for early November 2014. **Appendix B** of this working paper presents the implementation schedule of the REDDIG II network.

2.4 The study and implementation of the REDDIG II has been possible thanks to an ICAO regional technical cooperation project, whereby all member States have contributed to the development of the concept and to the implementation of all stages so far. It is also important to highlight that the same regional cooperation project has allowed member States to operate the existing REDDIG I since 2003 with a high level of availability.

2.5 The REDDIG is a globally unique experience in terms of the operation, maintenance, and installation of a regional network providing voice and data services as specified in the regional air navigation plans.

2.6 The REDDIG experience was presented at the Twelfth Air Navigation Conference, which recognised that ICAO technical cooperation projects were conducive to the implementation of regional projects. In this regard, it formulated Recommendation 1.6, which, in part b), stated that ICAO *examine the operation, management, and streamlining of the technical cooperation project and other similar regional experiences for the implementation of the regional digital network with a view to adapting this effective practice for use in other ICAO Regions.*

3. **Suggested action**

3.1 The Meeting is invited to:

- a) take note of the information contained in this working paper;
- b) review the activities listed in section 2 and in the Appendix to this working paper, and consider the successful experience related to the operation and maintenance of the current REDDIG I and the implementation of the REDDIG through a regional technical cooperation project; and
- c) discuss any other matters it may deem appropriate.

APPENDIX A

Brief description of REDDIG II network

The VSAT REDDIG II network is based on full meshed TDMA technology, allowing single hop connectivity amongst nodes. The network will be globally monitored by the central NMS located in Manaus and Buenos Aires (Ezeiza airport).

The synchronization of the stations is critical in such a system and the NMS integrated in two master modems allows to manage the network for the stations not to transmit on the same timeslot. As the synchronization is made by two master stations, no external synchronization or server-based administration is required for the satellite network to operate.

The REDDIG II network is composed by 16 sites in 14 countries and one extra site (Tegucigalpa, Honduras), and a new node in Brasilia will be installed in 2015 (see **Figure 1**).

The REDDIG II is an IP network. The IP part is not restricted to the multiplexer/router. IP part is integrated inside the MODEM and is used for traffic prioritization (with DiffServ), dynamic routing of IP packets (with OSPF), multicasting of IP packets or Header Compression.

Those features, associated to powerful traffic prioritization filters, makes Skywan MODEM able to classify traffic and associate the required treatment. This is especially useful for real-time applications, such as voice or RADAR data streams.

A site architecture is composed by four sections: RF outdoor, VSAT indoor, NMS and Ground backbone part. The principal equipment that conform a site are the Skywan IDU 1070 and Routers Cisco 2901 or 2911. The Cisco are flexible platforms, but have not the same slot capacity as the CX multiplexer of REDDIG I; but as we are IP based, it is easier and less expensive to use multiple Ciscos instead of having bigger chassis. (See **Figure 2**).

Each site for the ground backbone part is composed of a gateway multiplexor/router and an MPLS access router. The mux/router is used to gather all the services that are not IP based or already converted, and bring them to the MPLS access router. The ground backbone network is a MPLS network and the service provider is Level 3. (See **Figure 3**).

For the master stations sites the main equipment are two Skywan IDU 7000. Only one of the two modem 7000 is in charge of network synchronization in each master station (modem A). Modem B is a pure slave. For the modem B to operate as a master modem, it requires a configuration change on the global network, and the modem A will no longer operate as a master modem.

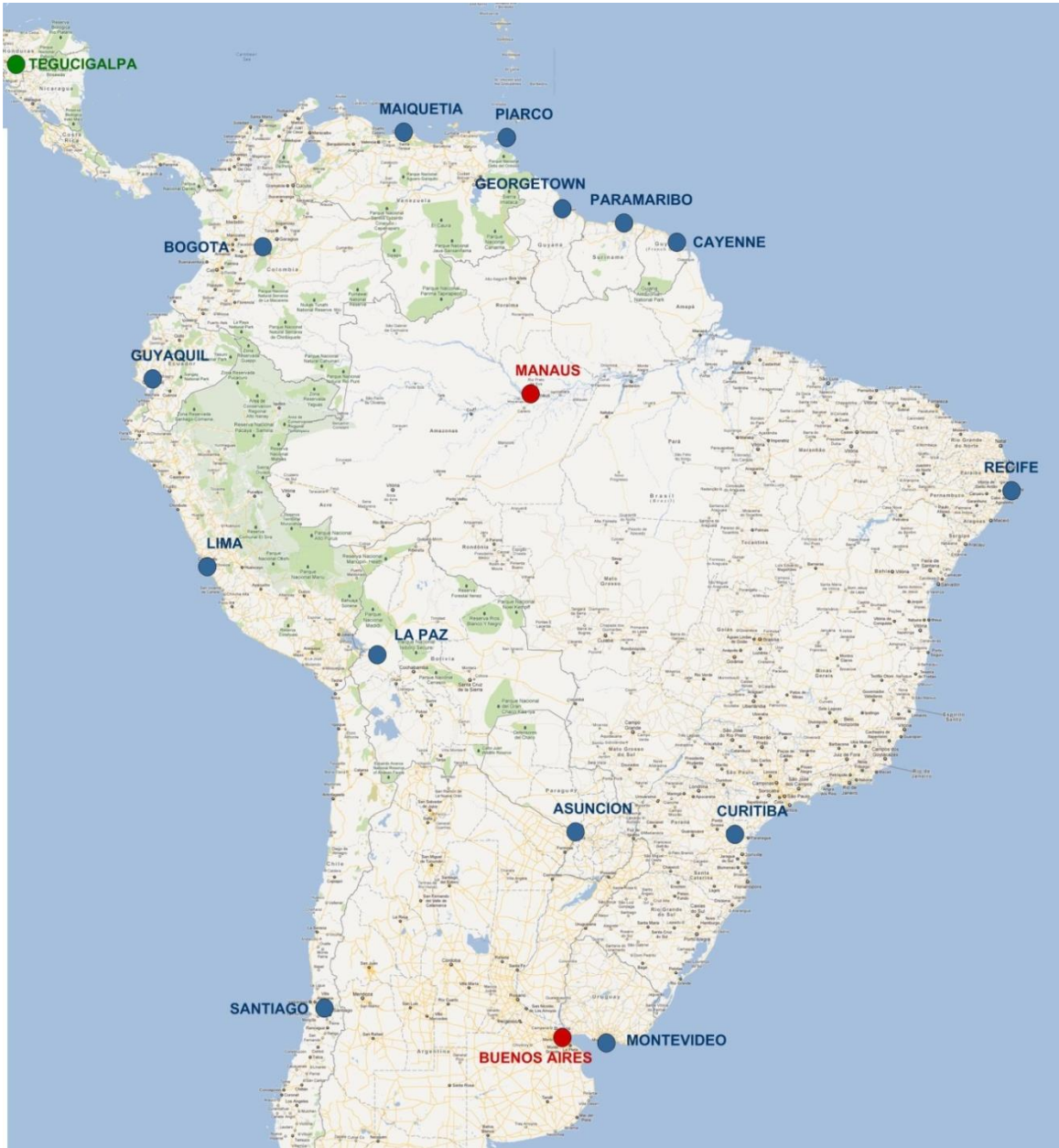


Figure 1 - REDDIG II network sites

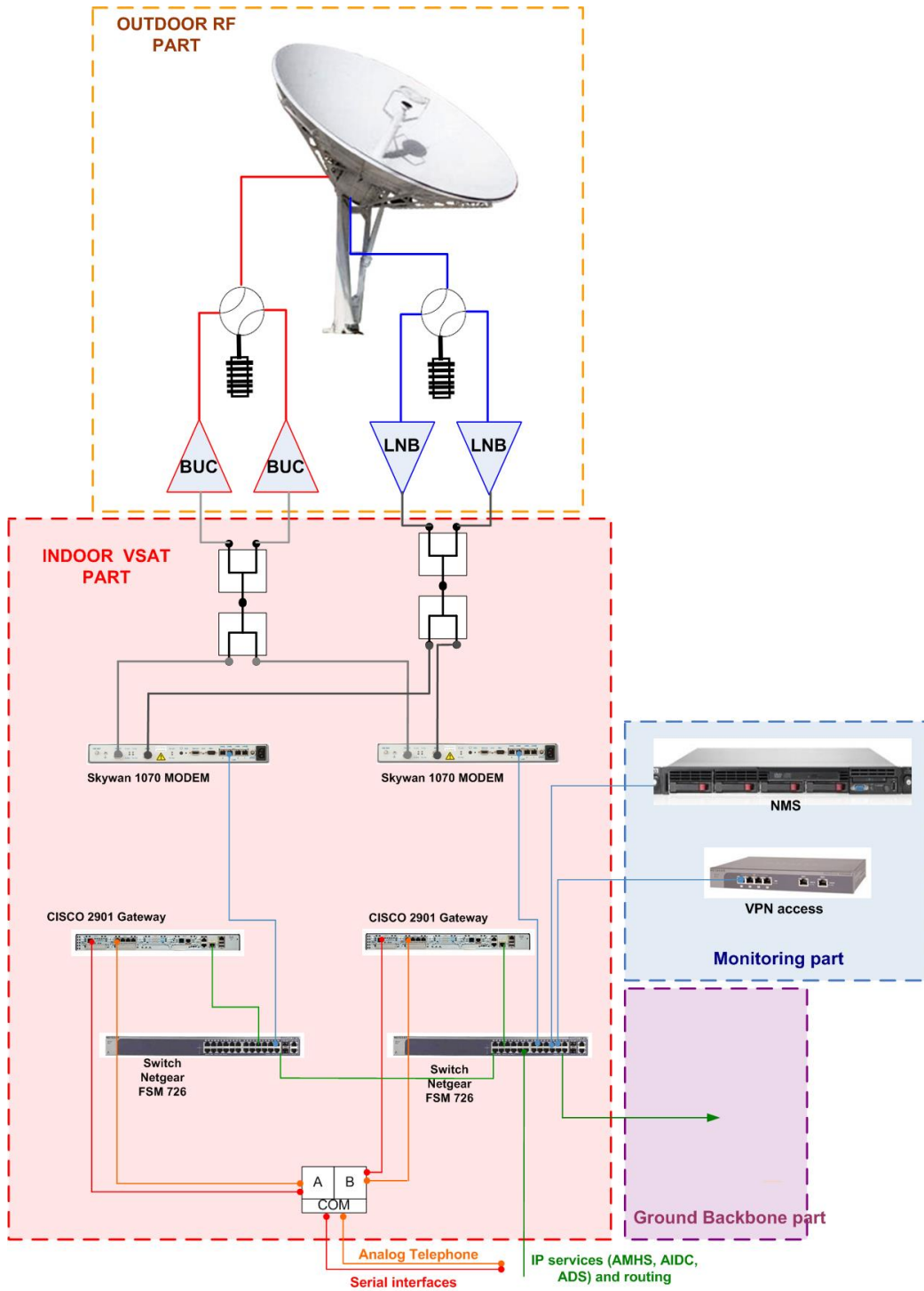


Figure 2 - Site Architecture



Figure 3 - Ground backbone network (Level 3 MPLS network)

APPENDIX B / APENDICE B

SAT/19-WP/07 NE/07

TENTATIVE TIME SCHEDULE / PHASES / PROGRAMA TENTATIVO - FASES

ID	Nom de la tâche	Duration	Start	Finish	Qtr 2, 2013		Qtr 3, 2013			Qtr 4, 2013			Qtr 1, 2014			Qtr 2, 2014			Qtr 3, 2014			Qtr 4, 2014			Qtr 1, 2015			Qtr 2, 2015			Qtr 3, 2015			Qtr 4, 2015			Qtr 1, 2016			Qtr 2, 2016			Qtr 3, 2016			Qtr 4, 2016						
					Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
1	Tentative REDDIG II implementation work programme	421 days	Thu 09/05/13	Thu 18/12/14																																																
2	Phase 1 - Project	136.57 days	Thu 16/05/13	Fri 22/11/13																																																
3	Documentation drafting and approval process	136.57 days	Thu 16/05/13	Fri 22/11/13																																																
4	REDDIG II preliminary design installation (SDD)	40 days	Thu 09/05/13	Wed 03/07/13																																																
5	Preparation of installation and training procedures documentation and NMS documentaion preparation	15 days	Thu 04/07/13	Wed 24/07/13																																																
6	FAT protocol preparation	10 days	Thu 25/07/13	Wed 07/08/13																																																
7	SAT protocol preparation	10 days	Thu 08/08/13	Wed 21/08/13																																																
8	Documentation submittance (SDD, FAT/SAT protocol, on-site installation procedure, training manuals) to ICAO	0 days	Wed 21/08/13	Wed 21/08/13																																																
9	Documentation review	12 days	Thu 22/08/13	Fri 06/09/13																																																
10	Technical-operational meeting	5 days	Mon 09/09/13	Fri 13/09/13																																																
11	Final design	23 days	Mon 16/09/13	Wed 16/10/13																																																
12	Documentation reviewed and approved	0 days	Wed 16/10/13	Wed 16/10/13																																																
13	Schedule DRM	30 days	Thu 17/10/13	Wed 27/11/13																																																
14	Phase 2 - REDDIG II implementation	215.29 days	Thu 17/10/13	Thu 14/08/14																																																
15	Purchasing and integration of VSAT equipment	35 days	Thu 26/12/13	Wed 12/02/14																																																
16	Purchasing of equipment and remittance to company HQ for integration	7 wks	Thu 26/12/13	Wed 12/02/14																																																
17	Preparation of ground backbone network	35 days	Mon 14/07/14	Fri 29/08/14																																																
18	Hiring of service for all nodes	2 wks	Mon 14/07/14	Fri 25/07/14																																																
19	Ground back bone commisioning	1 wk	Mon 25/08/14	Fri 29/08/14																																																
20	Integration at factory, training and FAT	67 days	Thu 13/02/14	Fri 16/05/14																																																
21	Equipment assembling at factory	6 wks	Thu 13/02/14	Wed 26/03/14																																																
22	Network configuration and pre-test	8 wks	Thu 06/03/14	Wed 30/04/14																																																
23	Documentation submittance for on-factory-training	0 wks	Mon 21/04/14	Mon 21/04/14																																																
24	On-factory-training	3 wks	Mon 21/04/14	Fri 09/05/14																																																
25	FAT	5 days	Mon 12/05/14	Fri 16/05/14																																																
26	FAT signature / Firma FAT	0 days	Fri 16/05/14	Fri 16/05/14																																																
27	REDDIG II Technical Operational Meeting	95 days?	Wed 26/03/14	Tue 05/08/14																																																
28	RTO Meeting	3 days	Wed 26/03/14	Fri 28/03/14																																																
29	RTO Meeting	2 days?	Mon 04/08/14	Tue 05/08/14																																																
30	Preparatory REDDIG II Course	5 days	Mon 31/03/14	Mon 07/04/14																																																
31	REDDIG II preliminary course in Bogotá	4 days	Tue 05/08/14	Fri 08/08/14																																																
32	Remittance of equipment to sites (customs clearance 1 month approx)	72 days?	Mon 02/06/14	Tue 09/09/14																																																
33	Preparation of equipment remittance	2.8 wks	Tue 03/06/14	Fri 20/06/14																																																
34	Preparation for the remittance of REDDIG II equipment in Rio for training	7 days?	Mon 02/06/14	Tue 10/06/14																																																
35	Ezeiza	11.4 wks	Mon 23/06/14	Tue 09/09/14																																																
36	La Paz	11.4 wks	Mon 23/06/14	Tue 09/09/14																																																
37	Rio de Janeiro	6.4 wks	Thu 12/06/14	Fri 25/07/14																																																
38	Santiago	11.4 wks	Mon 23/06/14	Tue 09/09/14																																																
39	Bogota	11.4 wks	Mon 23/06/14	Tue 09/09/14																																																
40	Guayaquil	11.4 wks	Mon 23/06/14	Tue 09/09/14																																																
41	Georgetown	11.4 wks	Mon 23/06/14	Tue 09/09/14																																																
42	Cayenne	11.4 wks	Mon 23/06/14	Tue 09/09/14																																																
43	Asuncion	11.4 wks	Mon 23/06/14	Tue 09/09/14																																																
44	Lima	11.4 wks	Mon 23/06/14	Tue 09/09/14																																																
45	Paramaribo	11.4 wks	Mon 23/06/14	Tue 09/09/14																																																
46	Piarco	11.4 wks	Mon 23/06/14	Tue 09/09/14																																																
47	Montevideo	11.4 wks	Mon 23/06/14	Tue 09/09/14																																																
48	Maiquetia	11.4 wks	Mon 23/06/14	Tue 09/09/14																																																
49	Manaus	11.4 wks	Mon 23/06/14	Tue 09/09/14																																																
50	Recife	11.4 wks	Mon 23/06/14	Tue 09/09/14																																																
51	Curitiba	11.4 wks	Mon 23/06/14	Tue 09/09/14																																																
52	Theoretical-practical course in Rio de Janeiro	20 days	Mon 11/08/14	Fri 05/09/14																																																
53	Session 1 (10 Spanish-speaking)	2 wks	Mon 11/08/14	Fri 22/08/14																																																
54	Session 2 (10 Spanish-speaking)	2 wks	Mon 11/08/14	Fri 22/08/14																																																
55	Session 3 (8 Spanish-speaking)	2 wks	Mon 25/08/14	Fri 05/09/14																																																
56	Session 4 (8 English-speaking) / Sesión 4 (8 personas en inglés)	2 wks	Mon 25/08/14	Fri 05/09/14																																																
57	On-site installation activities	74 days	Fri 29/08/14	Wed 10/12/14																																																
58	Simultaneous on-site installation	1 wk	Mon 29/09/14	Fri 03/10/14																																																
59	Verificación red terrestre	1 day	Fri 29/08/14	Fri 29/08/14																																																
60	Verificación servicio satélite /Satellite service verification	2 days	Mon 06/10/14	Tue 07/10/14																																																

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					Qtr 2, 2013	Qtr 3, 2013	Qtr 4, 2013	Qtr 1, 2014	Qtr 2, 2014	Qtr 3, 2014	Qtr 4, 2014	Qtr 1, 2015	Qtr 2, 2015	Qtr 3, 2015	Qtr 4, 2015	Qtr 1, 2016	Qtr 2, 2016	Qtr 3, 2016	Qtr 4, 2016								
					Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
61	Switching REDDIG I to REDDIG II	2 days?	Tue 07/10/14	Wed 08/10/14																							
62	PSAT / NAT (provisional and network acceptance test) Validation States members	3 days	Thu 09/10/14	Mon 13/10/14																							
63	PSAT / SAT Signature(State member through REDDIG focal point)	0 days	Mon 13/10/14	Mon 13/10/14																							
64	Operational Readness Demonstration (ORD)	30 days?	Tue 14/10/14	Mon 24/11/14																							
65	FNAT (Final acceptance test)	3.6 wks	Tue 25/11/14	Thu 18/12/14																							
66	FSAT signature	0 days	Thu 18/12/14	Thu 18/12/14																							
67	Two (2) years' guarantee	104.2 wks	Fri 19/12/14	Fri 16/12/16																							

