Agenda Item 6: Operational implementation of new ATM automated systems and integration of the existing systems

FOLLOW-UP TO IMPLEMENTATION ACTIVITIES OF PROJECT AUTOMATION

(Presented by the Secretariat)

SUMMARY

This working paper presents the progress made to date regarding activities conducted for the operational implementation of the new ATM automation systems, as well as the integration of the already existing.

REFERENCE:

- Final report of SAM/IG/10 (Lima, Peru, 1-5 October 2012)

ICAO strategic objectives:	*A – Safety; and* *C – Environmental protection and sustainable development of air transport*

1. **Background**

6.1 The SAM/IG/10 meeting noted that five (5) memoranda of understanding (MoUs) have been signed since 2009 for the interconnection of radar data and automatic hand-off of flight plans between neighbouring countries, but no major progress has been made. Only some progress has been made for the exchange of radar data using the IP protocol between the radars of Durazno in Uruguay and Quilmes in Argentina, but no operational use has been established yet.

6.2 Regarding the interconnection of automated systems between the Maiquetía and Manaus ACCs, SAM/IG/10 meeting noted that the configuration had been implemented in the REDDIG and in the radar data and flight plan display systems. It also noted that the tests for the automatic transfer of flight plans and radar data were still pending, their completion being expecting in late 2012.

6.3 Since the SICD (System Interface Control Document) was drafted in 2008 for the interconnection between CAR/SAM ACCs, describing the external interfaces and ATC messages of the countries, the ATC systems of several of these countries had undergone changes and new automated systems had been implemented. Therefore, SAM/IG/10 meeting felt that the Secretariat should circulate the SICD to all the States of the Region for updating. In this regard, the Secretariat will send the SICD in late October 2012 in order to receive responses by 31 December 2012.

6.4 In order to assist States in finding solutions for the completion of the interconnection, SAM/IG/10 meeting considered the following actions:

a) The Coordinator of Project C1 should prepare a questionnaire on the requirements for the interconnection of automated systems and send it to the SAM Regional Office by the end of February 2013.

b) The ICAO SAM Regional Office should circulate the questionnaire amongst all the States of the Region that have established MoUs for the interconnection of automated systems on the first week of March 2013, requesting their response by the end of March 2013.

c) Two experts in ATM and CNS automation, respectively, and experts from the industry that might be interested should conduct missions to the States that have signed MoUs for the interconnection of automated systems in order to identify the causes that prevent the completion of the interconnection and submit a detailed plan of all the design and installation considerations for the implementation of the interconnection. This activity would require the support of Regional Project RLA/06/901, through two experts in automated systems for a period of two weeks. Visits would take place in April 2013.

2. **Analysis**

2.1 During SAM/IG/10 meeting, an MoU was signed between Brazil-Peru; likewise, Brazil and Paraguay started coordinations for the drafting of an MoU for AMHS interconnection, to be signed in principle, during SAM/IG/11 meeting.

2.2 In accordance with the goals established in the Project Automation, all MoUs are scheduled to be completed by the end of 2013: the three pending from 2012 plus the 9 for 2013. It is expected that coordinations regarding the pending MoUs start during the Meeting, having completed and signed most of them by SAM/IG/12 meeting.

2.3 With regard to the interconnection of automated systems, activities have started between Argentina and Chile, and there is a two-automation-experts mission scheduled to take place during the week of 6 to 10 May 2013 with the objective of restarting and concluding the interconnection trials between the systems of Brazil and Venezuela. It is expected that information is received during this Meeting on the current situation of these interconnections.

2.4 The Secretariat sent letter LT 12/3.54 – SA607 of 2 November 2012, requesting States to update the SICD document (*System Interface Control Document for the Interconnection of ACC Centers of the CARSAM Region*), which describes the surveillance systems, as well as the automated systems (radar data and flight plan processors). In this respect, there is updated information from Brazil and it is expected that further information can be obtained during the Meeting.

2.5 The C1 Project Coordinator drafted a questionnaire on automated systems interconnection requirements, presented as **Appendix A** to this working paper. The Secretariat sent letter LT 12/3.54 – SA130 of 11 March 2013 to Argentina, Brazil, Chile, Peru and Uruguay, with the aim of identifying the reasons for the delays and formulate recommendations permitting the completion of the interconnections. Replies were received from Argentina, Brazil and Peru, summarized in **Appendix B** to this working paper. It is expected that during the Meeting, Chile and Uruguay can present their replies to the questionnaire.

2.6 The visits scheduled to States that had MoUs drafted for the interconnection of automated systems, initially for April 2013, have been postponed to take place in the second semester of 2013.

2.7 The C1 Project Coordinator has updated the Project C1 document, on the basis of the progress achieved in the implementation of the activities therein considered, shown in **Appendix C** to this working paper.

3. **Action suggested**

3.1 The Meeting is invited to:

a) Take note of the information presented;
b) Analyze the topics taken under consideration in section 2, as well as Appendices A, B and C to this working paper, with the aim of becoming aware on the progress made to establish the pending MoUs, the implementation of the interconnection agreed upon through the already signed MoUs, the replies to the automation questionnaire, and the actions to tak to complete the automated systems interconnection tasks; and
c) Analyze any other aspects related with this subject that the Meeting might consider necessary.

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APPENDIX A

ICAO QUESTIONNAIRE IN SUPPORT OF AUTOMATED SYSTEMS INTERCONNECTION BETWEEN ADJACENT ACCS

1. What type is the radar data processing system (RPDS) (multi-track, ADS-B/C, multilateration, mosaic, etc.)?

2. Who is the manufacturer of the system?

3. What is the version of the processing system in operation?

4. ¿Does the RPDS have capability of receiving and sending traces in ASTERIX 62/63 format?

5. Will the submittance of radar signals be directly to the radars involved (ASTERIX 1/2) or will it be effected as of RPDS (ASTERIX 62/63)?

6. What is the ASTERIX Protocol ICD (Interface Control Document) used? What is the versión of the document?

7. What is the IP (*Internet Protocol*) Address of the RPDS (or of the radars)?

   a. Which are the traces reception and submittance doors available (for RPDS)?

8. Is there a firewall between the RDPS and the REDDIG router?

   a. What are the specifications of the firewall?

   b. What is the IP address of the firewall?

c. How many ports are available in the firewall (which)?

d. Which are the NAT (*Network Address Translation*) table conversion addresses of the firewall?

9. What is the IP Address of the REDDIG router?

a. ¿What are the NAT table conversion addresses of the REDDIG router?

10. Who configurates the RDPS, firewall and routers (Administration technicians or hired company)?

a. In the event of hired company, is there already a signed contract?

b. ¿Do the Administratiion technicians have training for these services?

11. What is the interconnection diagramme from the RPDS (or radars) to the REDDIG router?

12. How is the remittance of traces through RDPS habilitated?

13. Does the ACC automated system have capability of using messages in AIDC format?

a. Which ICD was used? What version?

b. Are AIDC messages used for communications between domestic centres? Which?

c. What AIDC messages is the system capable of using? What is the configuariion of each message?

d. Which is the means used for the exchange of AIDC messages: AMHS, AFTN or other?

14. Is the ACC automated system capable of using messages in OLDI format?

a. Which ICD was used? What version?

b. Are OLDI messages used for communications between domestic centres? Which?

c. Which are the OLDIG messages the system is capable of using?

d. What is the phases diagramme (messages sequence) of the dialogue procedure established in the system?

e. Which is the means used for the exchange of OLDI messages: AMHS, AFTN or other?

15. Is the automated system connected to AMHS or AFTN and configured to send AIDC messages?

16. Is the automated system connected to AMHS or AFTN and configured to send OLDI messages?

17. Is the automated system capable of a hand-off?

a. Is this capability habilitated?

b. If not, do you know how to habilitate this capability?

18. Does the ACC automated system conduct hand-off between control sectors or ACCs in the country by using OLDI or AIDC?

19. With which countries are there operational agreement document for the transfer of air traffic?

APPENDIX B

PROJECT C1
INTERCONNECTION OF AUTOMATED SYSTEMS QUESTIONNAIRE – REPLIES FROM STATES

1. BACKGROUND

The ICAO Lima Office sent States a questionnaire containing questions on the air traffic control automated systems, with the aim of counting with a detailed vision on the difficulties to make the interconnection programmed in Project C1.

To date, only 3 States, Argentina, Brazil and Peru, replied to the questionnaire.

The results are presented hereunder.

2. ANALYSIS

The analysis made to the replies enables the following observation:

1. Radar data

- Argentina and Peru have automated systems from the same manufacturer, INDRA. The versions installed in each State is unknown;
- The ACC-CW and ACC-AZ automated systems in Brazil are different. The ACC-AZ system is planned to be changed in the end of July 2013 by a SAGITARIO system, similar to the ACC-CW;
- The RDPS have multitrack processing capabilities. The ACC-CW SAGITARIO has capability for ADS-B/C and multilateration. The Argentina INDRA system has ADS-B/C capability. Information was not received as to whether the Peruvian system has ADS-B/C capability;
- All systems have radar data transfer capability through ASTERIX CAT 62/63, but Argentina does not have it habilitated and requires the purchasing of licenses. In this case, the use of data directly from the radar is proposed, through ASTERIX CAT 1/2;
- The documentation adopted by the INDRA system regarding ASTERIX protocol is unknown. The Brazil SAGITARIO adopts the EUROCONTROL documentation.

2. Flight plans

2.1. AIDC

- Argentina counts with AIDC functions, but still does not use handoff between domestic centres;
- Brazil has this function in its ACC-CW SAGITARIO system, but still does not use AIDC for the handoff between domestic centres, which is done with the use of Doc 4444 messages. The estimate date for AIDC operational use is the end of 2013;
- AIDS implementation in the SAGITARIO system took under consideration the ASIA/PAC Region IDC;
- Peru counts with AIDC functions, but still does not use the handoff between domestic centres;
- All States can transmit messages through AMHS.

2.2. OLDI

- Argentina counts with OLDI functions, implemented by INDRA. The specifications adopted are unknown. Argentina informed it has no interest in the future use of OLDI for the handoff, both internally as externally, as it is trying to use AIDC;
- In Brazil, the ACC-CW SAGITARIO system counts with OLDI functions, on the basis of EUROCONTROKL specifications, but it still does not use handoff between domestic centres. In the event of implementation, the transmission will be conducted through AMHS.
- Peru counts with OLDI functions, implemented by INDRA. The specifications adopted are unknown.

2.3. Others

- The Brazilian automated systems, including SAGITARIO and X-4000, count with handoff functions on the basis of Doc 4444 and uses them for the automated handoff between the national control centres, both in the ACC, as in the APP and TWR.

3. Connection and safety

- The Argentinean radars count with IP addresses and are integrated to a national ATN network, based on TCP/IP. The routing is made in Ezeiza;
- The Brazilian and Peruvian RDPS systems count with IP addresses from the LAN;
- The Argentinean automated system is protected by a router with firewall functions;
- Brazil is trying to implement a firewall for the protection of the ACC-CW automated system. The ACC-AZ already counts with a firewall;
- Argentina and Brazil count with routers connected to REDDIG. Peru only furnished information on the REDDIG MUX MEMOTEC;
- Argentina and Brazil already count with NAT configurations.

APPENDIX C

PROJECT AUTOMATION

SAM Region	**PROJECT DESCRIPTION (DP)**	**PD N° C1**	
Programme	**Project Title**	**Starting Date**	**Ending Date**
Automation and ATM Situational Awareness *(Programme Coordinator: Onofrio Smarrelli)*	Automation *Project Coordinator: Alessander Santoro (Brazil)* *Contributing experts: SAM/IG ATM Automation Group*	May 2008	June 2016
Objective	Support States of the SAM Region in the implementation of automated systems, and in their regional interconnection		
Scope	The scope of the project includes the initial drafting of guidelines, trials for the identification of the automation level required at the Region's ATS units in the short and medium term, and the implementation of automation systems and their interconnection through the VSAT based South American digital network (REDDIG)		
Metrics	• Drafting of the following documents: ✓ Guidance document on automated systems requirements at ATS units (SSS) ✓ Guideline for the implementation of integrated automated systems ✓ Action plan for the interconnection of automated systems ✓ Preliminary interface control document (ICD) between systems for the interconnection of ACCs in the SAM Region ✓ Memorandum of Understanding (MoU) model for the interconnection of automated systems • Interconnection of automated systems between adjacent ACCs in the SAM Region: • Reduction in number of operational errors, including LHD in the SAM Region		
Strategy	• All tasks will be conducted by experts nominated by States and organizations of the SAM Region members of the Project *Automation*, under management of the project coordinator, in coordination with the programme coordinator. Communications among project members, as well as between the project coordinator and programme coordinator, shall be carried out through teleconferences and the Internet. In addition, the programme coordinator, together with the project coordinator and the contributing experts, can convene at SAM/IG implementation meetings • Once studies are completed, the results will be submitted to the ICAO programme coordinator as a final consolidated document for its analysis, review, approval and presentation at the GREPECAS PPRC		

Justification	• The CAR/SAM air traffic control centres have had difficulties in duly coordinating air traffic, an important factor contributing in air traffic incidents. The air traffic control automated centres' interconnection will permit a coordinated automated air traffic for the transfer of responsibilities between CAR/SAM adjacent area control centres, thus reducing the risk in aeronautical incidents generated by undue coordination activities and improving, at the same time, the planning phases for an efficient control of flights from/to corresponding Flight Information Regions (FIR). • The interconnection of automated systems would be facilitated, in view of REDDIG (SAM VSAT regional network), which has the necessary capability to transport automated systems applications • This project contributes towards the implementation of SAM PFF CNS 04, ATM 05 and ATM 06 of the *Air Navigation System Performance-Based Implementation Plan for the SAM Region (SAM PBIP)*
goals	• Initial drafting of five guideline documents in support of the implementation of automated systems interconnection for completion in the period (May 2008 – October 2012) • Initial drafting of 18 MoU for the interconnection of automated systems 5 MoU period 2009-2011 4 MoU for the end of 2012 9 MoU for the end of 2013 • Implementation of the interconnection of automated systems *Flight plan* 9 OLDI interconnections 2012-2014 1 interconnection considering Doc 44 for 2012 7 AIDC interconnections for period 2012-2013 *Asterix protocol radar data* 20 radar data exchanges using Asterix protocol period 2011-2014 1 owner exchange for 2012
Related Projects	• ATFM • Implementation of the New ICAO Flight Plan Model • Improve ATM Situational Awareness

Project Deliverables	Relationship with Performance Based Regional Plan (PFF)	Responsible	Status of Implementation[1]	Delivery Date	Remarks
Regional guideline document for the automation level required according to the ATM service provided in airspace and international aerodromes, assessing • operational architecture design, • characteristics and attributes for interoperability, • data bases and software FPL, CPL, CNL, RLA, etc, and • technical requirements.	PFF SAM CNS 04 PFF SAM ATM 05 PFF SAM ATM 06	Project Coordinator and ATM Automation Group		Completed June 2011	The System and Subsystem Specifications (SSS) document has been drafted for the identification of automated requirements necessary at ATS units (ACC), and a revision process has been conducted with the support of RLA/06/901 project and SAM/IG ATM Automation Group. Document published in site www.lima.icao.int.
Guideline for the integration of automated systems and corresponding action plan	PFF SAM CNS 04 PFF SAM ATM 05 PFF SAM ATM 06	Project Coordinator and ATM Automation Group		Completed October 2010 Completed May 2012	The following has been drafted: Guideline for the integration of automated systems and revision process. Action plan revision for the integration of automated systems and continuous revision. Both documents drafts with the support of RLA/06/901 project and the SAM/IG ATM Automation Group. Document published in site www.lima.icao.int.

[1] ***Gray**: Activity has not started*
***Green**: Activity has or will deliver planned milestone as scheduled*
***Yellow**: Activity is behind schedule on milestone, but still within acceptable parameters to deliver milestone on time*
***Red**: Activity has failed to deliver milestone on time, mitigation measures need to be identified and implemented*

Project Deliverables	Relationship with Performance Based Regional Plan (PFF)	Responsible	Status of Implementation[1]	Delivery Date	Remarks
Preliminary interface control document (ICD) between systems for the interconnection of ACCs in the SAM Region	PFF SAM CNS 04 PFF SAM ATM 05 PFF SAM ATM 06	Programme Coordinator, Project Coordinator and ATM Automation Group		Completed October 2008 October 2012	Document ICD drafted. Document elaborated with the support of RLA/98/003 and later, RLA/06/901. Document published in site www.lima.icao.int. The document requires updating in view of installation of new automated and surveillance systems in the Region
Guidelines for elaboration of Memorandum of Understanding (MoU) for the implementation of the automation system interconnection	PFF SAM CNS 04	Project Coordinator and ATM Automation Group		Completed October 2009	A model MoU for the interconnection of automated systems has been developed, with the support of RLA/06/901 project and SAM/IG ATM Automation Group. The MoU model is published in site www.lima.icao.int.
Drafting of Memorandum of Understanding (MoU) for the interconnection of automated systems between adjacent ACCs	PFF SAM CNS 04 PFF SAM ATM 05 PFF SAM ATM 06	SAM States, Project Coordinator and ATM Automation Group		October 2013	To date, six MoU have been drafted and signed between the following SAM States: Argentina-Brazil; Argentina-Chile; Argentina-Uruguay, Brazil-Uruguay; Brazil-Peru; and Brazil-Venezuela. 12 additional MoUs are planned to be drafted.

Project Deliverables	Relationship with Performance Based Regional Plan (PFF)	Responsible	Status of Implementation[1]	Delivery Date	Remarks
Interconnection of automated systems between adjacent ACCs	PFF SAM CNS 04 PFF SAM ATM 05 PFF SAM ATM 06	SAM States		June 2016	1. Radar data has been interconnected between Argentina-Uruguay using IP protocol through REDDIG; 2. Flight plan and radar data exchange trials have been conducted between Brazil-Venezuela through REDDIG; 3. Letter LT 12/3.54-SA130 containing a questionnaire was sent to Argentina, Brazil, Chile, Peru and Uruguay with the aim of identifying the causes for the delays and formulate recommendations permitting the completion of the interconnections. Replies were received from Argentina, Brazil and Peru; 4. Replies from Argentina, Brazil and Peru were analysed upon; 5. A mission was programmed for 6 to 10 May 2013, involving two automation experts with the aim of restarting and concluding the interconnection trials between the Brazil and Venezuela systems. Visits to the remainder States will be scheduled for June-July 2013, with presentation of results at SAM/IG/12. 6. Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, panama, Paraguay, Peru, Uruguay and Venezuela were requested for the updating of the SICD document. SICD updating was received regarding the Brazilian automated systems

Project Deliverables	Relationship with Performance Based Regional Plan (PFF)	Responsible	Status of Implementation[1]	Delivery Date	Remarks
Monitor implementation progress of automation activities in the SAM Region		Programme Coordinator and Project Coordinator		September 2009-December 2014	
Resources necessary	Implement facilities required by SAM States permitting the interconnection of automated systems in accordance with the dates established in the MoUs drafted and signed to this end				