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WORKING PAPER

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Sixth Eastern Caribbean Network Technical Group (E/CAR/NTG/6) and Fourth Eastern Caribbean Radar Data Sharing Ad-hoc Group (E/CAR/RD/4) Meetings
Miami, United States, 13 - 14 July 2015

Agenda Item 4: Surveillance Sharing Activities
4.3 Implementation of radar data sharing tasks

Radar activities and ADS-B trials

(Presented by SNA/AG, France)

EXECUTIVE SUMMARY

This paper is presenting surveillance activities performed by SNA/AG.

Action:	The suggested actions are presented in Section 3.
<i>Strategic Objectives</i>	<ul style="list-style-type: none">• Safety• Air Navigation Capacity and Efficiency
<i>References</i>	Fifth Eastern Caribbean Network Technical Group (E/CAR/NTG/5) and Third Eastern Caribbean Radar Data Sharing Ad hoc Group (E/CAR/RD/3) Meetings, Guadeloupe, French Antilles, France, 22 to 24 October 2014.

1. Introduction

1.1 The surveillance in French West Indies is based on the use of two (2) monopulse secondary radars (MSSR) located on Guadeloupe and Martinique and on a multi radar tracker (MRT) called DACOTA.

1.2 ADS-B is being tested in French Guyana by SNA/AG. One station could be installed in Martinique in 2016 to be used as a backup to radars.

1.3 ADS-C is being used in French Guyana. AIDC trials are planned in 2017 with Brazil and Dakar. ADS-C is not required in FWI.

2. Discussion

E/CAR CPU

2.1 France made an offer to the Eastern Caribbean States to deliver, free of charge, IRMA2000 radar display software (and the associated computer-CPU) to assist E/CAR States with familiarization of surveillance tools.

2.2 French radar data (Dacota MRT fed with Guadeloupe MSSR and Martinique MSSR) is sent from Martinique to Trinidad, and TTCAA can activate through E/CAR network a circuit to any State to provide radar data. This requires that the Cisco routers are equipped with a data licence. TTCAA advised that while the primary routers are equipped with the data licence, the secondary routers are not and that they were working with TSTT to have this done.

2.3 States willing to have that radar display had to do a request to SNA/AG (French civil aviation) following a template provided by France.

2.4 States having the system installed have to sign a letter of agreement with French civil aviation authorities.

2.5 This agreement indicates that French civil aviation does not provide maintenance on these systems. They are delivered for familiarization, in order to facilitate the process of acquisition of surveillance systems in E/CAR.

2.6 The installation was performed from March to June 2015 as in following table:

Item No.	Quantity of CPUs	State/Territory	Installation Date	Location	LoA Signed
1	1	Saint Vincent and the Grenadines	27 January 2015	TWR	LOA
2	2	Antigua and Barbuda	19 March 2015	TWR and Tech room	LOA
3	1	Grenada	17 April 2015	TWR	LOA
4	1	Montserrat	18 May 2015	Tech room	TBD
5	1	Dominica	15 June 2015	TWR	LOA DASPA
6	1	Barbados	18/19 June 2015	IFR Room	LOA GAIA
7	1	Nevis	25 June 2015	TWR	LoA NASPA
8	1	Saint KITTS	25 June 2015	TWR	LoA SCASPA
9	1	Trinidad	TBD	For trials	
10	1	Anguilla	TBD		

2.7 Basic training was provided, as a basic user manual. Basic maintenance actions were demonstrated.

2.8 French civil aviation thanks States for the preparation (prerequisites) and for their welcome.

2.9 Dialogs with ATCOs has shown very high interest, and sometimes disillusion (the system cannot be used for ATC, radar coverage sometimes not fitting airspaces). In all cases, exchanges were very fruitful.

2.10 The system will probably generate strong demand from ATCOs.

2.11 Most displays were installed in towers. Monserrat has the display in the technical room, and the letter of agreement is still not signed.

2.12 SNA/AG would welcome visits in Martinique or in Guadeloupe of agents coming from E/CAR ATIS willing to discuss with Radar ATCOs or Radar display engineers.

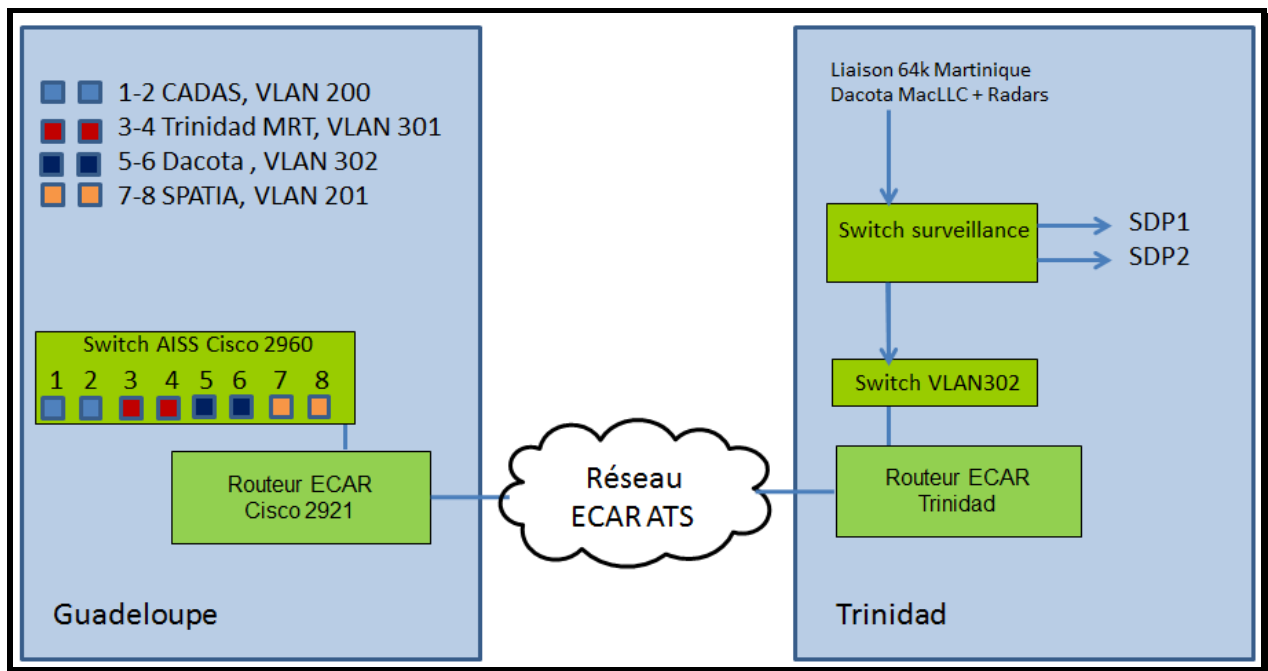
Sending French Radar Data to Trinidad over E/CAR AFS Network

2.13 French radar data (Dacota MRT and the two (2) MSSR) are now connected in Martinique to ECAR network. Trinidad now receives these radar data through two (2) channels:

- One via a France Telecom 64 kbps leased line; and
- One via ECAR2 network (via 1 Mbps GCN connection).

2.14 This redundant link should enhance availability of these data to Trinidad, and in turn to IRMA2000 users.

2.15 The connection to the switch that allows sending French radar data to ECAR has to be confirmed or modified and documented (below the former synopsis to be upgraded). Martinique would need on AISS switch to get ports for SPATIA, CADAS, Selex MRT, French radar Data output, French radar data input. Guadeloupe has the same needs but for French radar data output.



2.16 The France Telecom leased line from Martinique to Trinidad is old technology no more supported by the operator. It has to be replaced by an IP link. A technical and financial proposal will be submitted by SNA/AG to TTCAA.

Radar activities with Saint Lucia

2.17 Two old international leased lines are feeding Saint Lucia radar display systems (on the two (2) airports) with French radar data. These lines are points of weakness. In June 2015, one (1) system was fed through E/CAR AFS network in George Charles airport.

2.18 Data sent through E/CAR is non correlated data: only squawk is displayed, as in St Lucia, Flight ID is displayed thanks to correlation information sent by Martinique. Saint Lucia needs to keep Flight ID so that data should be sent to E/CAR AFS network too (very low beamwidth). SNA/AG has to coordinate with TTCAA for this action.

2.19 Saint Lucia ATCO training: ATCOs from Saint Lucia will be trained by SNA/AG in Saint Lucia mid-August for three (3) weeks. Six (6) training sessions will be performed (30 ATCOs) in compliance with ECCAA requirements. That training should give ATCO licence for using radar situational awareness. In future, will be studied training St Lucia ATCOs with the ATC simulator in Martinique.

ADS-B and ADS-C activities

2.20 In 2014, two (2) studies were performed, one (1) from Guyane ATS and one (1) from Toulouse civil aviation technical center. The conclusions were that MLAT was not a cost effective solution in French Guyana, but a set of five (5) ADS-B stations.

2.21 The call for tender for the installation of five (5) ADS-B stations is programmed in 2016. In the meantime, French Guyana is presently installing two (2) Thales ADS-B stations for tests and to develop the concept of operations. For the time being, no surveillance guidance nor separation are performed in French Guyana.

2.22 Once the five (5) stations will have been installed, the two (2) present stations could be used in Martinique and Guadeloupe in case radars are failing. In the meantime, Martinique will purchase one (1) station for trials in 2016.

2.23 ADS-C / CPDLC is in use in French Guyana since May 2011 with FANS1/A equipped airplanes. With these flights, CPDLC is the primary means for communication. HF is still in use with others (HF antennas have been renewed in 2010 for 3 M\$). Trials should be performed in 2017 to test and activate AIDC with Brazil and Dakar.

2.24 No ADS-C CPDLC is planned for FWI.

RADAR activities in FWI

2.25 End 2015: replacement on both radars of the automatic fire detection and extinguishing system. Each radar being stopped for three (3) days (not at the same time).

2.26 Beginning 2016, work on power generators on each radar: one (1) day stop for each.

2.27 Plan for Mode S upgrade for both radars: 2022. Radar evaluation: Twice a year, both radars of Martinique and Guadeloupe are evaluated by Martinique radar team using a Eurocontrol tool: SASS-C. Results are compared with the Eurocontrol Surveillance Standard (that specifies minimum performances: Pd, Mode A code quality, Mode C, false plots, splits, multipath, accuracy, bias, gain, time stamping, etc).

Example:

ENSEMBLE N°2 27 juin 2014 PM	Recom- mandation	TFFR Pointe à Pitre MSSR Le 28/06/2014	TFFF Fort de France MSSR Le 26/06/2014	LFBL Boulogne Mode S Le 03/07/2014
Nombre de plots mode S		0	0	590 419
Nombre total de plots		115 077	107 958	615 732
Nombre de tours d'antenne		7 441	7 463	1 480
Vitesse moyenne d'antenne (s)		3,92	3,90	6,08
Taux de charge (plots/tour)		15,5	14,5	416,0
DETECTION PLOTS				
Probabilité de détection (%)	>97%	98,37	98,77	99,40
QUALITE DES CODES MODE A				
Validés par le radar (%)		99,00	99,34	99,99
Validés et corrects (bons) (%)	>98%	99,00	99,34	99,97
Validés et incorrects (faux) (%)	<0,1%	0,00	0,00	0,01
Taux de mode A garblés (%)		1,23	1,62	0,48
QUALITE DES CODES MODE C				
Validés par le radar (%)		98,94	99,57	99,94
Validés et corrects (bons) (%)	>96%	98,94	99,57	99,94
Validés et incorrects (faux) (%)	<0,1%	0,00	0,00	0,00
Taux de mode C garblés (%)		1,13	1,46	1,74
Taux global de faux codes A et C	<0,2%	0,00	0,00	0,01
FAUX PLOTS				
Simplex (%)	<0,1%	0,000	0,000	0,001
Multiplés (%)	<0,3%	0,010	0,036	0,008
Doublons (%)	<0,1%	0,008	0,030	0,005
Réflexions (%)	<0,2%	0,000	0,005	0,003
Lobes secondaires (%)	<0,1%	0,002	0,002	0,000
BIAIS				
En distance (m)	<100 m	19,6	46,6	30,5
De gain en distance (m/Nm)	<1 m/NM	0,44	0,19	0,30
En azimut (°)	<0,1°	0,055	0,004	0,010
En temps (ms)	<100 ms	2	0 réf	1
PRECISION				
Précision en distance (m)	<70 m	25,22	24,59	25,00
Précision en azimut (°)	<0,08°	0,039	0,029	0,046
SAUTS				
Taux de sauts (%)	<0,05%	0,000	0,004	0,002

2.28 Multi Radar evaluation: Every three (3) years, full analysis is performed by radar team in the central French technical office in Toulouse, France. Performances are evaluated at the level of the ATCO display. Evaluation is performed recording a large amount of radar data coming from traffic opportunity. Derived from these data coming from several radars in the same time, a “true” trajectory is reconstructed, and statistics, diagrams, extracts of bad cases are performed Depending on the minimum radar separation value (5 NM in FWI), there are performances to check. For instance:

Exigence E-HACCU-3 [C/NC]

In the domain of radar interest, the 2D RMS Delta in position on the turning population shall be less than:

300 m for a 3 NM minima of separation

500 m for a 5 NM minima of separation

800 m for a 8 NM minima of separation

1000 m for a 10 NM minima of separation

A portion of trajectory will be qualified « in turn » if transversal acceleration of reference trajectory is higher than $1,5 \text{ m/s}^2$.

Exigence E-VISU-2 [C]

In the domain of interest RMS duration between 2 updates of altitude of a same aircraft shall not exceed:

5 s for a 3 NM minima of separation

8 s for a 5 NM minima of separation

10 s for a 8 NM or 10 NM minima of separation.

All cases whose duration is higher than 10% of above figures shall benefit detailed analysis and shall be presented to the ad-hoc GEMINI commission. That analysis shall identify causes, potential operational consequences, and risk mitigation mesures.

2.29 This evaluation process is quite complex and long. That is why the decision was taken for FWI not to use other E/CAR radar or Trinidad MRT for radar separations (to avoid associated evaluation process).

HAITI Activities

2.30 ATCOs and engineers from Guadeloupe and Martinique are participating to activities in Haiti: set up of a Safety Management System, set up of Technical procedures, training ATCOs (on position training).

2.31 Calibration flight was performed for Haiti in 2015. FWI used to use ASECNA flight, but after the ATR42 plane's unavailability, FAA calibration flight was used, but measurements were not fitting all French requirements. Since 2014, a private Beech 90 based in Guadeloupe is being used. It was equipped to receive the calibration system that comes from France for each calibration flight. That calibration flight could be used for regular E/CAR flight checks or for one (1) shot flights.

Replacement of FWI ATM Systems

2.32 A modernization program was set up five (5) years ago for French Overseas sites. A subprogram called SEAFLIGHT is dealing with ATM systems replacement (Surveillance and Flight data processing systems). The first site to be equipped will be Cayenne, French Guyana, with an ADACEL system (with ADS-C / CPDLC capabilities).

2.33 The two (2) following sites are Martinique and Guadeloupe. A first selection has selected three (3) providers: NavCan, Adacel and INDRA.

2.34 During Madrid Word ATM in March 2015, special demonstration were prepared for three (3) persons of SNA/AG.

2.35 The system that will be selected for FWI will include tactile displays for surveillance and flight data will include a traffic simulator, a recording and replay system, a test platform. The system will be operated with electronic flight strips, and will allow automatic coordination between Martinique and Guadeloupe, and possibly with Selex systems from Trinidad and Barbados.

2.36 The planning of the project is following:

- End 2014: End of preselection process (for all overseas territories);
- Sept 2015: operational requirements (SNA/AG);
- 1st half 2016: technical requirements and specifications, and second selection process to select one provider among the 3;
- 2nd half 2016: analysis of offers, demonstrations by companies, visits to ANSP using these systems;
- End 2016: Selection of the provider and contract notification for FWI;
- 2017: system configuration by the provider ;
- End 2017: system installation on sites;
- 1st half 2018: system tuning, training;
- 2nd half 2018: Full operation of the system.

2.37 Perimeter of the project: The Dakota MRT system would be kept, as French civil aviation gets high knowledge on the MUST multiplot tracker. The COSNET alert system would be kept too, as all safety nets are already tuned (MSAW, STCA, APW). This should reduce risks on the project.

2.38 Perimeter of the project: studies are ongoing to replace the General Information Panel (displaying MET information, NAVAIDS status, operational documentation, charts, etc...).

2.39 Perimeter of the project: CAGOU French AFTN Switch will be replaced by a COMSOFT system: AIDA and CADAS-ATS.

3. Suggested action

3.1 The Meeting is invited to take in consideration FWI surveillance activities.