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Agenda Item 4 **Air Navigation Matters**

4.2 Follow-up on the implementation of the NAM/CAR Regional Performance-Based Air Navigation Plan (RPBANIP) in Eastern Caribbean:

SYSTEM AUTOMATION PROGRESS

(Presented by Trinidad and Tobago)

SUMMARY	
This Information Paper presents information on the ATM/CNS capabilities of the Trinidad and Tobago Air Traffic Management Automation System.	
Strategic Objectives	*This information paper is related to Strategic Objectives:* *A. Safety – Enhance global civil aviation safety* *C. Environmental Protection and Sustainable Development of Air Transport*

1. Introduction

1.1 In consonance with the implementation of the PBN Airspace Concept, supported by the ICAO Global ATM Operational Concept (Doc 9854), PBN Manual (Doc 9613), and the Regional Performance-based Air Navigation Implementation Plan (RPB ANIP), the Trinidad and Tobago Civil Aviation Authority (TTCAA) embarked upon an ATM Automation modernization project in 2007 when, after open tendering and due process of evaluation and selection, SELEX Sistemi Integrati SpA (S. I.) of Italy was awarded a contract to provide in the first phase; a Radar Remoting System (RRS) installed in the old Area Control Centre (ACC) and in the second phase, a fully automated ATM System for the new facilities. Closely linked to the TTCAA process of improving its operations, an extensive project which included new facilities - ACC at Piarco, Control Tower at Piarco, administrative and training buildings and a refurbished Control Tower at Crown Point was undertaken and culminated in the new TTCAA complex.

2. The System gives the TTCAA an ATM capability with a high level of automation, providing an improved situational awareness and efficient ATS service provision and airspace management service to users and stakeholders. The ATM system comprises radar surveillance utilizing radar data emanating from the Radar Head in Trinidad and multi radar tracking (MRT) data from the French Antilles (Martinique and Guadeloupe) with capability of accepting additional surveillance inputs from other radar heads and sensors, for example, Automatic Dependent Service - Broadcast (ADS-B) and Contract (ADS-C). The System provides increased surveillance with conflict detection complemented with additional air/ground communications, Very High Frequency (VHF) radio equipment; a revised ground/ground communications - Aeronautical Fixed Service (AFS) network and Aeronautical Fixed Services System (AFSS), an ATC radar simulator and advanced technologies with associated tools and functionalities.

3. Phase one included a new Voice Communications and Control System (VCCS), four Controller Work Positions (CWPs) with situational displays which realizes automated procedural and/or radar flight tracking methods utilizing electronic (e-Strips) and/or paper flight progress strips (p-Strips) aside from control sectors with manual/procedural operational positions, a Flight Data Processing System (FDPS), a surveillance Radar Data Processing System (RDPS), a Control and Monitoring System (CMS), facilities with advanced tools inclusive of safety alerts are elements of the RRS and audio and radar data recorders.

4. Phase two equipped the new Piarco ACC with a modern ATM system comprising VCCS, redundant VHF radio equipment (seven (7) extended range VHF radios – five (5) area and two (2) approach), improved ground-to-ground voice (E/CAR AFS Network) and data (AMHS/AISS) communications, new and additional surveillance capabilities and functionalities displayed as a mosaic at nine (9) suites of Controller working Positions (CWPs) with associated tools and functionalities and a CMS with advanced supervisory control tools and functionalities. Additional data capabilities (CPDLC, ADS-C and ADS-B) are presently under trial.

5. The Automation system integrates information coming from PSR/MSSR, ADS-B and ADS-C reports, Multi Radar Tracking (MRT) derived from the French Antilles and Trinidad and Tobago and merges them to generate a unique system track for each tracked aircraft within the surveillance coverage area resulting in a seamless mosaic of radar information within the airspaces of the FIR West of 057°W for providing a radar service to airspace users. As an aside, it is noted that the data from the component radar systems can also be displayed as “stand alone” information/direct access radar data (DARD) on CWPs.

6. The Trinidad and Tobago ATM Automation modernization project consists of the following components:

- Mode S MSSR/PSR En-route Radar located in Trinidad
- ATM processing and functionalities
- Voice Communication and Control System (VCCS)
- Aeronautical Mobile Services for Approach and Tower services at Piarco International Airport and ANR Robinson International Airport.
- Air Traffic Controller Console suites with 2048x2048 LCD panels, Barco ADP361 series 24” Auxiliary Display Panel and Barco High-Bright 24” (Control Towers)
- Radio links between the Radar High Site and Piarco
- Voice and data Recorders
- Electronic flight strips

- AIDC, CPDLC and ADS functionalities
- D-ATIS
- Weather systems

7. The Radar system comprises:

a) Radar Sensors which are in charge of the generation of radar plots and weather information in order to make them available to the Data Processing segment. To achieve this task, for the PSR/MSSR system five sub-blocks can be identified:

- Solid State Primary Surveillance Radar (ATCR 33S-DPC) and Antenna (G-33). The ATCR-33S DPC (Digital Pulse Compression) is an 9.5 KW S-band Air Traffic Control Radar, designed to operate in conjunction with modern automated ATC systems based on highly sophisticated data processing.
- Mode-S Monopulse Secondary Surveillance Radar (SIR-S) and Antenna (ALE-9). The SIR-S is the Selex-SI Monopulse Secondary Surveillance Radar with Mode-S capabilities.
- Antenna Base with Dual Motor Drive and Dual Encoder

b) Data Processing Subsystem whose main task is to generate radar tracks from the received radar plots (PSR and SSR plot) and to correlate them in order to make these information available in real time to the Operator Support segment. The processing chain is composed of the following sub-blocks:

- at the radar head - Dual Radar Head Processor (RHP)
- at Centre - Dual Surveillance Data Processor (SDP)

c) Monitoring, Control & Maintenance Subsystem receives Status Messages from all system units and is responsible of their presentation in a graphical way, in order to support the User in controlling and monitoring the whole system. Moreover it allows the calibration of Radar Sensors and their preventive and corrective maintenance. Four sub-blocks are conceived for this purpose:

- Radar Local Control Panel (LCP) and RHP Video Terminal Unit (VDU)
- Radar Maintenance Monitor (RMM)
- Local Control and Monitoring System (LCMS)

d) The antenna and turning gear group consists of the following:

- ALE-9 monopulse LVA secondary antenna (co-mounted)
- G33 Primary antenna
- Antenna base
- Azimuth Motor Drive Unit

8. The main functionalities of the ATM automation System are:

- Surveillance Data Processing Systems (SDP) & Gateway Functionalities (GTW) deployed by means of the RFE (Radar Front End) and MRT (Multi Radar Tracker) respectively.
- Recording and Playback System (RPB) & Advanced Tools (ADT);

- Flight Data Processing System (FDPS). Flight Data Processing System (FDPS) & Information Display System (IDS) provide Flight Plan and Additional information to be used in the ATC system. The Auxiliary information is presented on the Auxiliary Display.
- Air/Ground Data Link Processing System (AGDL). Air Ground Data Link system (AGDL) provides data-link capability integrated in the ATM system. The AGDL functionality is deployed by means of ACG (Air Ground Communication Gateway) and ADSP (ADS Processor).
- Information Display System (IDS)
- Control and Monitoring System (CMS)
- Operator input and Display System (ODS)

9. In order to provide the ground system with the capability to fully integrate data-link applications, the ATM Communication Gateway (ACG) provides the interface with the external data-link applications (CPDLC). It is the ATM System component that handles the datalink communication protocols and connects the ATM System to the datalink networks to provide air/ground data communications. The ACG implements a set of layered communication protocols, as specified by international standards and protocols. The ADS Processor (ADSP) is the interface between the ACG and the rest of the System.

10. The Advanced Tools have been designed with the aim of providing air traffic controllers with a tool able to:

- Predict, detect and prevent all conflict situations (SNET), terrain collision hazards and imminent airspace penetrations with ‘adequate’ warning time giving enough time to pilots to eventually react and manoeuvre;
- Operate in the short term using prediction and warning times of the order of 2 minutes or less (notification in advance will be provided by MTCD);
- Ensure visual and audible warnings in case of actual or potential conflict detection;
- Keep low the invalid conflicts rate, realizing an optimum trade-off between probability of detection and false alert rate;
- Ensure high adaptation to the different airspace conditions.

11. CWP Suites are dedicated to Real Traffic Display, Playback, Flight Plan Management and Alerts Management and are designed as the key element of the Human-Computer-Interface (HCI) in the Air Traffic Control (ATC) operational environment. The CWP provides all visual representations essential to surveillance and executive control functionalities and covers the operational requirements for a composite “sector suite” (mainly Radar Executive & Planner controller Positions looking at the same area of responsibility at the same time). The CWP is able to generate and display electronic strips related to flights and has the following capabilities:

- User friendly Human Computer Interface using multiple windowing techniques
- Integrated radar / procedural working position
- Radar data presentation (plots, tracks)
- Fixed and Dynamic maps presentation
- Warning and Alarm Presentation
- Radar and Procedural order management
- Operational Supervisor order management
- Display and system settings data presentation

- Reduced Flight Plan Management
- List Presentation and Management
- Manual Identification of unidentified targets
- Dynamic reallocation among real and playback presentation capability

12. The Flight Data Processing System (FDPS) is a system based on an open architecture which provides the processing of flight plan data and other related information to support air traffic controllers during the planning and progress phases of flights, in accordance with the referenced ICAO PANS-ATM 4444 rules.

13. EVAPLOTTER (EVAluator & PLOTTER) is SELEX-SI Off-Line Tool, which is able to receive radar data available on a LAN or from recording media provided by the Record and Playback (REC/PLB) CSCI. The Main Functionalities are:

- Radar Data acquisition from Recording Devices
- Radar Data Acquisition and Generation via LAN or serial line
- Acquired Air Traffic Scenarios Visualization and Plotting (including geographic and ATC maps)
- Statistic Reports on ATC system tracking capability

14. ATC Simulator - The capability for Air Traffic Controller training is provided by the ATC Simulator facility. The SELEX-SI ATC Simulator is designed for the basic and advanced training of Executive and Planner Controllers. It is a flexible and powerful system having the capability of running a wide range of ATC Simulation scenarios. The ATC Simulator provides the capability to train the ATC Controllers from the early stages until the achievement of an operative capability in a simulated environment reproducing what will be the operational scenario due to the use of the same equipment and HMI applied in the Operational environment. The main functions are:

- ATC simulation for radar and planning controllers training in APP and ACC radar environments.
- Support functions for the ATC environment, including:
  - Workload evaluation,
  - Flow control,
  - Optimum airspace configuration,
  - New control procedures

15. Maps Production Program - The X-Window Map Generator (XMG) is a software (SW) application package realised to produce maps in the UNIX environment. In particular, the XMG main activities are:

- Construction of Fix Database defined as the set of the points in the FIR (Flight Information Region) that shall be the datamark of the application maps;
- "Interactive" maps generation during one or more work sessions;
- Production of "System Notation" files to describe the Map data;
- Production of "TCA" messages employed to describe the Traffic Conflict Alert functionality;
- Production of the Radar coverage diagrams.

16. Automatic Terminal Information Service (ATIS) - The TRS ATIS system provides for the preparation of ATIS bulletin in accordance with ICAO Annex 11 and World Meteorological Organization Manual on codes, Volume 1, 1988 1995 edition, WMO, No. 306 specifications. Voice messages are continuously transmitted over their assigned output channel until they are replaced with new messages. Broadcasted messages are not affected, during transmission, by actions performed by the operator during the preparation of the next ATIS bulletin.

17. The MULTIFONO® type M600-S Voice Communication and Control Switch (VCCS) guarantee the requirements of ground-to-air and ground-to-ground communications necessary for the safe and efficient implementation of Air Traffic Control services. It features:

- Radio communications
- Telephone communications
- Intercom communications
- Switchboard facility
- Inter-site Networking communications and management
- Legal Recording
- System Monitoring and Control Management
- Simulator Facility

3. Conclusion

3.1 The TTCAA conducted trials and training in 2010-2011 and operations in the new facilities commenced in July 2012. The next phase of automation planned is the implementation of AIDC. This plan is presently under development.

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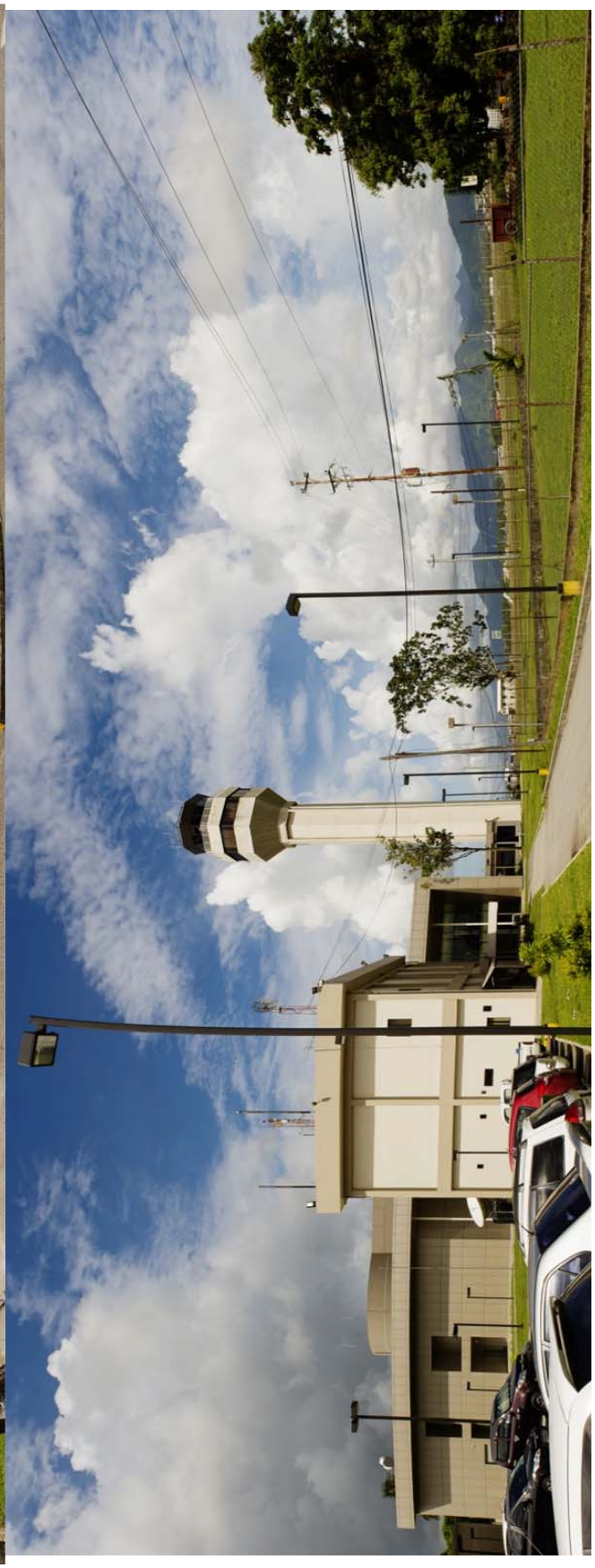
APPENDIX



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