International Civil Aviation Organization
North American, Central American and Caribbean Office

WORKING PAPER

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 5:   **Radar Data Display Request for Proposal (RFP)**
                 5.1   **Definition of Proposal**

DEFINITION OF PROPOSAL

(Presented by the Secretariat)

EXECUTIVE SUMMARY	
This paper proposes for consideration the draft technical specifications in the definition of the Request for Proposal for radar data displays.	
Action:	Suggested Actions are presented in Section 3.
Strategic Objectives:	• Safety • Air Navigation Capacity and Efficiency
References:	• 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 E/CAR States and Territories recognized that Surveillance data sharing provides many operational benefits to aircraft operations, air traffic management and safety improvements. Surveillance data sharing will bring to the air traffic environment benefits such as increased surveillance coverage which directly impacts on airspace utilization and efficiency by permitting a reduction in aircraft separation and improved safety of operations. It will provide redundancy within areas where nearby surveillance systems overlap. It will also reduce traffic congestion and provide improved homogeneity in ATC operations between neighbouring states.

1.2   Within the Eastern Caribbean, the radar data sharing tasks are assigned to be followed-up by the E/CAR CNS Committee in the form of the E/CAR/RD group. In addition to radar, surveillance now embraces Automatic Dependent Surveillance - Broadcast and Contract (ADS-B and ADS-C).

1.3   Under the Radar Data Sharing activities, the provision of Surveillance Data Processor (SDP) to be implemented as end-user equipment within the Eastern Caribbean States was agreed in the Radar Data Sharing Implementation Plan. This initiative is intended to provide Radar-Assisted Situational Awareness (RASA) to controllers in order to enhance the provision of procedural air traffic control service as recognized by the E/CAR/DCA/25 Meeting. The RASA programme involves two (2) phases:

a) **Phase 1** - donation of surplus used computer CPUs by France that are already programmed to receive the data per the systems installed in Saint Lucia, which are intended to test the system on a relatively short-term basis.

b) **Phase 2** - State acquisition of permanent SDP systems for either medium-term continuation of RASA (as decided by the States), or in the case of Antigua, in conjunction with the intended implementation of its own radar control service.

1.4   For Phase 2, a Request for Information (RFI) Process was agreed to search market potential radar data display for medium-long term solution. The interested vendors were requested to provide a presentation of their proposal to the E/CAR Radar data Sharing Meeting in Guadeloupe, French Antilles in October, 2014 prior notification to ICAO and the Eastern Caribbean Radar Data Sharing Group (E/CAR RDS). For the E/CAR Radar Data Display RFI Process, four (4) vendors responded:

- ADACEL
- COMSOFT
- INDRA
- SELEX

2.   Discussion

2.1   Each vendor provided a presentation to the E/CAR/RD/3 Meeting and answered questions from the participants. Having seen the presentations and the questions and answers made with the RFI presentations, the following conclusions were agreed by the RD Group:

a) maintain a scalable solution from single display to more automated functions (tracker, FDP, etc);

b) data Quality of Service (QoS) or Questions and Answers (QA) to be incorporated; and

c) each State/Territory needs to clearly define the way forward regarding automation.

2.2   Based on the information obtained from the RFI responses, the attached draft technical specifications for the Request for Proposal was formulated.

3.   Suggested Action

3.1   The Meeting is invited to:

a) review and comment on the draft technical specifications; and

b) take any other action as deemed necessary.

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APPENDIX

REQUEST FOR PROPOSAL

SURVEILLANCE DATA PROCESSOR AND RELATED RADAR DATA DISPLAYS

1.   Introduction

1.1   Surveillance data sharing provides many operational benefits to aircraft operations, air traffic management and safety improvements. Surveillance data sharing will bring to the air traffic environment benefits such as increased surveillance coverage which directly impacts on airspace utilization and efficiency by permitting a reduction in aircraft separation and improved safety of operations. It will provide redundancy within areas where nearby surveillance systems overlap. It will also reduce traffic congestion and provide improved homogeneity in ATC operations between neighbouring states.

1.2   Within the Eastern Caribbean, the radar data sharing tasks are assigned to be followed-up by the E/CAR CNS Committee in the form of the E/CAR/RD group. In addition to radar, surveillance now embraces Automatic Dependent Surveillance - Broadcast and Contract (ADS-B and ADS-C).

1.3   Trinidad and Tobago is host to the radar data server. The PIARCO Air Traffic Management (ATM) system is able to provide a maximum of twenty-four (24) (serial) outputs or multiple outputs via LAN with IP addresses. The data will be provided as System Track (ASTERIX Category 62 standard) data format. For this purpose, a gateway comprised of dual Dell servers is integrated into the system. The surveillance data output will be centered on the same system centre of the PIARCO ATM system. The gateway will provide the output through a serial line, which will be split by means of a passive data distributor.

1.4   To achieve this initiative, Trinidad and Tobago will collect the surveillance data, as and when, it becomes available from States, process the data via multi sensor fusion on the PIARCO ATM system and then disseminate the data to the E/CAR states via the E/CAR Aeronautical Fixed Services (AFS) network.

2.   Scope and Objective of This Document

2.1   The scope and objective of this document is the provision of a Surveillance Data Processor (SDP) per State and its related Radar Data Displays as shown in Table 1. The provision shall include the Design, Supply, Delivery, Installation, Testing and Commissioning to be implemented as end-user equipment within the Eastern Caribbean States. The local site requirements shall be defined based on each site specific environment based on the bidders mandatory site survey.

2.2   The SDP shall be able to process and display the Piarco Multi Radar Tracker (MRT) output with correlated (flight Plan information) and non-correlated radar tracks. The MRT will comprise of a fusion of all the available surveillance sources. **Table 1** below shows the participating States and the number of positions/displays required:

State/Territory	No. of Positions/ Displays	Site
Anguilla	1	Airport Control Tower
Antigua	2	(1) Airport Control Tower (1) Approach Control Room
Dominica	1	Melville Hall: Airport Control Tower
Grenada	2	Maurice Bishop: (1) Airport Control Tower (1) Approach Control Room
Montserrat	1	Airport Control Tower
Nevis	1	Airport Control Tower
Saint Lucia	2	Hewanorra: (1) Airport Control Tower George Charles: (1) Airport Control Tower
Saint Vincent	1	Airport Control Tower

2.3   The interface to the AFS Network at each User State shall be via TCP/IP on an IP port of the AFS Cisco router. Router configurations, if any, shall be under the responsibility of the TTCAA.

2.4   The project will be implemented as a turn-key regional project with on-site installation support provided by the local technicians and management of the project by a committee to be composed of User States.

3.   General Requirements

3.1   The solution shall be scalable. It should be presented to allow the end user state to start from the most basic system (a single ATC display of the Piarco MRT data) and expand as desired to a full system with ATM functionalities including modules of billing, flight data processing, ability to add data inputs independent of the Piarco MRT, recording and playback functions.

3.2   The solution should be independent of the Piarco ATM system, that is, it should rely only on the MRT data and not on any other processing of the Piarco ATM System.

3.3   This system shall have an open architecture design and high performance characteristics. Key requirements are its adaptability and scalability to suit any air traffic management environment. The system shall provide a cost effective and low-risk solution for the air traffic management automation needs.

3.4   All designs, materials, manufacturing techniques and workmanship shall be in accordance with the highest accepted international standards for this type of equipment.

3.5   The eventual winning tenderer (hereafter referred to as the Supplier) shall be responsible for the installation and commissioning of all the equipment and elements covered by this specification, including all accessories, cables, cabinets, supports and other necessary installation materials/elements. The Supplier shall also provide the manpower, technical administration, materials, equipment and special tools needed to complete the work.

3.6   The System hardware shall be based on COTS (Commercial Off-The-Shelf) hardware components, available on the market place, and already used for similar critical systems.

4.   Project Services

4.1   Project services shall include but not be limited to the following:

         a)   Project and Quality Management;
         b)   Factory Acceptance;
         c)   Delivery of equipment;
         d)   Site installation, Interoperability and Acceptance Tests;
         e)   Training;
         f)   Spares recommendation; and
         g)   Warranty Services.

5.   Risk Management

5.1   The Supplier shall establish as part of the Project Management Plan a risk management process to manage risks throughout the program and addressing risk identification, risk assessment, risk avoidance and/or mitigation and risk control. Risk assessment shall be monitored during Progress Meetings.

6.   Progress Reviews and Reports

6.1   Progress reviews will be held as defined based on the duration of the project. If needed, Customer participation will be requested via phone or videoconference methods. A Progress Report will be issued after each Progress Review.

7.   Custom Clearance and Packaging

7.1   The equipment shall be delivered according to DAP conditions (Incoterms 2011 -Delivered at Place) to the end user (list attached as App 1). (Seller bears cost, risk and responsibility for cleared goods at named place of destination at buyer's disposal. Buyer is responsible for unloading. Seller is responsible for import clearance, duties and taxes.)

8.   Packaging

8.1   The goods to be delivered shall be new, manufacturer's original and compliant with the specifications and indicated tolerances herein.

8.2   The Supplier shall bear responsibility that the delivered goods shall be packed and sealed and clearly marked with sufficient details for their identification. The packaging shall provide guaranteed protection of the equipment against unfavourable weather conditions and other factors that might affect the quality of the equipment even for prolonged storage periods. Regardless of the form of shipment, all indispensable facilities for the proper handling of the packages shall be provided.

8.3   The packaging to be used for the transport of the equipment and/or materials from the factory to the port of entry into the user states shall follow standard factory practices for long-distance carriage.

8.4   Prior to packing, the goods shall be subjected to the necessary factory acceptance tests to verify the quality and compliance with the technical requirements.

8.5   The spare parts shall be supplied in their original packing, duly protected against humidity with dehydrating or silica elements. Each set of spare parts shall be labelled with the part number and denomination of the item, with an indication of the quantity in each package.

9.   System Installation

9.1   The Supplier shall describe briefly the site layout he foresees in his proposal, taking into account the necessary room for access of the hardware maintenance team. Environment conditions required and power consumption of the whole system shall be stated.

9.2   The Supplier shall state clearly which part of the installation he will be responsible for, and which responsibility is expected to be taken by the User State regarding installation matters.

9.3   The Supplier shall clearly state the preparation activities that need to be performed by User State prior to installation.

10.   Work Statement

10.1   Notwithstanding the information supplied in this document, the Supplier shall conduct a site visit, at his own expense, to determine the appropriate locations of all systems involved and shall provide the User States with a site survey report and adequate illustrations and drawings. Not conducting a site visit does not diminish the responsibility of the Supplier from fulfilling all the conditions of this document.

11.   Maintenance Procedures and Standards

11.1   The Supplier shall submit with his proposal his regular procedures and methodologies for maintenance of the equipment. The procedures shall be in accordance with established standards and shall include administrative procedures and method of spare parts management.

12.   Redundancy, Fault Tolerance and Recovery

12.1   One of the major requirements of the System is to guarantee continuous processing. High availability equipment is required.

12.2   The Supplier shall explain how the hardware fault-tolerant feature is assured and state how redundancy, fault tolerance and recovery will be achieved to protect against service degradation.

12.3   Fault tolerant shall be understood as a group of similar entities equipped with automatic mechanisms that support each other in case of failure and/or when any element of the group is out of service, with the purpose of providing continuity in the operation of services provided. The operation of these mutual support mechanisms should not produce any interruption in the operation or in the services provided.

12.4   Redundant shall be understood as the implementation of the fault tolerance measures employing identical entities.

12.5   Independent entities (for example: equipment, ports, circuits etc.) shall be understood as entities that are physically independent of each other and that do not use a common element.

12.6   Redundant equipment shall be understood to be a physical entity supplied in a common chassis that has redundancy in its common parts and that permits change of common parts without disruption in service.

12.7   Simple equipment shall be understood as a physical entity supplied in a common chassis that do not have redundancy in its common parts.

12.8   In the instance that some components of the Systems are not hardware fault-tolerant the impact on operation of the failure of such components shall be described including the procedures to restore the components to operation.

12.9   In the event that the System includes hardware fault-tolerant units (typically the servers) and unit of active/standby configuration, the requirements stated above shall apply to only the functions supported by the units concerned.

12.10   The Supplier shall propose a design with no **single point of failure** (SPOF) and systems shall have high availability architecture (excluding software).

12.11   The configuration of the system shall permit planned periodical tests of the backup equipment or in the duplicated part of the redundant equipment for the purpose of verifying its operability. These tests shall not adversely affect the service of the System.

13.   System Reliability, Availability and Maintainability

13.1   System Reliability

13.1.1 The System will be considered to have failed when it does not give any support for the execution services, such operational inactive mode being not the result of a deliberate maintenance action.

13.1.2 Itemised reliability figures of the critical hardware components (MTBF and MTTR) shall be provided.

13.1.3   The Supplier shall describe the scenario where the System cannot restart automatically following a System failure, for example: Failure of the power supply; or a software error that prevents the System from restarting, and describe specifically how the System can be restarted.

13.1.4   The User States intend to place a two–year maintenance contract with the Supplier. Therefore, the Supplier shall declare his willingness to support a maintenance contract after the warranty has ended.

13.2   *Hardware Maintainability*

13.2.1   The Supplier shall describe how the hardware and software maintenance will be conducted during the warranty period. When submitting this plan, the Supplier shall bear in mind that the User States shall carry out first-line hardware maintenance, including Line Replaceable Unit (LRU) swapping. The appropriate training shall be provided.

13.2.2   The Supplier shall propose a list of spare parts he estimates necessary to keep the System at the level of availability stated above.

13.2.3   The Supplier shall state the turn-around time of failed hardware components during the warranty period. It shall be detailed whether the time stated is valid during week-ends and holidays.

13.3   *Software Maintainability*

13.3.1   The Supplier shall give a detailed description on:

    a)   The services offered for software maintenance during the warranty period (e.g. how a software problem can be investigated, fixing of bugs, System restart with a new application software release);
    b)   The availability of those services (office hours, at night, during the week-end); and
    c)   The split of responsibility between the Supplier and the User States.

13.3.2   The Supplier shall include in his proposal the facility to provide remote maintenance support. This may consist for instance in accessing the System over the Internet to log into the system and perform investigation of software faults as if the supplier was on site.

14.   Technical Specifications

14.1   The SDP shall be supported by a state-of-the-art COTS computer, and a high resolution Traffic Situational Flat Panel colour monitor of raster scan type non-interleaved, for monitoring traffic at and in the vicinity of the airfield, having as a minimum 1024 X 1024 pixels, typically 21 inches, with accompanying keyboard and mouse or track ball.

14.2   The workstation computers, as a minimum, shall consist of a state of the art processor (3GHz), be equipped with an 80GB hard drive, a DVD drive, 2 GB of RAM.

14.3   Latest commercially available equipment with special emphasis on locally acquirable within or close to the E/CAR region

14.4   Interfaces: Serial interface (HDLC) as well as Ethernet (UDP/IP) should be available for data acquisition.

14.5   The equipment shall have a menu to allow the operator to modify the different parameters such as brightness, tones, range, label size, colour, content of the information presented in the zones of general and specific information.

14.6   The equipment shall be capable of the following:

- Multi-layer color map
- Adaptable map projection
- Center, offset, pan and zoom
- Flight position from surveillance or flight plan
- Adaptable flight position symbols that depict flight attributes
- Adaptable multi-page flight data tag (full, limited, basic)
- Automatic tag relocation to avoid overlap
- Predicted track line
- Flight position history
- Range rings
- Lat/Long grid
- Special use airspace dynamic display
- RADAR coverage volume dynamically displayed

14.7   Basic software features:

- Presentation zooming
- Windows management
- Data storage and export options
- Operable with Windows operating system or compatible

14.8   Display information from SSR Mode A, Mode C and Mode S

14.9   Display RADAR Map information

14.10   Display Reserved SSR codes including 7500, 7600 and 7700, SPI/operation of IDENT, safety-related alerts and warnings as well as information related to automated coordination etc., in a clear and distinct manner.

14.11   Capability to display ADS-B Asterix Category 21 data.

14.12   The workstation(s) shall be provided with English characters to input the commands included in the operational software.

14.13   The following features (minimum requirements) shall be available on the ATC Display:

- RADAR track identification and display
- RADAR data monitoring
- Aircraft identification, automatic and manual SSR code correlation
- Graphic tools interaction

- Alarms and warnings (STCA, MSAW, DAIW, RVSM, MTCD, etc.)
- Operational data management

14.14   When power is restored after a power failure, the display system shall present the information with the last configuration parameters.

14.15   The appropriate RADAR maps for RADAR display overlays shall be provided. These would have a wide range of user functions including user-configurable range features. When such source data is available, all maps shall apply the accepted world standard, WGS-84 earth-centred coordinate system.

14.16   Maps provided shall at least meet the following minimum requirements:

- The ability to overlay specific maps and routes on a global digitized map.
- Ability to plot new air routes.
- Maps to cover extrapolated flight following and conflict prediction information areas.

14.17   The ATC displays shall indicate MSSR information and extrapolated tracks displayed in different colours to demark the difference between actual RADAR airspace and extrapolated airspace based on flight plan and other input information.

14.18   A redundant GPS based master clock with multiple input system to enable system time coordination and to synchronise all equipment provided in this document.

14.19   The facility for the input for artificial RADAR targets shall be provided.

14.20   Aircraft positions on track labels display, either RADAR data, or ADS, or flight plan data shall contain information/data about that aircraft position accordingly, and to be continuously displayed by numerical characters in the predefined formats suitable for air traffic control and management. The movement of track labels position shall assure that:

- Two overlapping labels if any, shall automatically separate when controllers select automatic function (auto rotation); or
- Controllers shall be able directly change track label position by clicking/releasing the mouse-buttons (manual rotation)
- Controller shall be able to change flight plan data by using track labels. In order to perform the data changes easily and quickly, the system shall provide proper options correlating to this function under the "Pop up menu" form and shall allow controllers to run the options by using mouse.

-END-