**STATEMENT OF WORK FOR THE
PROVISION OF RADAR DATA DISPLAYS FOR THE EASTERN
CARIBBEAN STATES/TERRITORIES
"E/CAR RADAR DATA DISPLAYS-RDS"
EASTERN CARIBBEAN RADAR DATA SHARING REQUEST FOR
INFORMATION (RFI)**

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**RELEASED BY:
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1.   INTRODUCTION

1.1   Radar data sharing provides many operational benefits to aircraft operations, air traffic management and safety improvements. Radar 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 improve safety of operations. It will provide redundancy within areas where nearby Radar systems overlap, cost benefits to airline operators due to improved service and optimum flight performance. It will also reduce traffic congestion or efficiency manages traffic in busy ATC environments and homogeneity in ATC operations between neighbouring states.

1.2   The Radar Data sharing activities in the E/CAR Region has been discussed since the first meeting of the E/CAR/DCAs and E/CAR/WG Meetings. During the Fourth Meeting of the PIARCO FIR Policy Group (PIARCO/FIR/PG/4), it was accepted the initiative of Trinidad and Tobago to provide the radar data server for the sharing/exchange/remoting of radar data in the Eastern Caribbean (Ref. conclusion PIARCO/FIR/PG/1/2).

1.3   The radar data sharing tasks are assigned to be follow-up by the E/CAR CNS Committee, under the Radar Data Sharing Group.

1.4   Following the Radar Data Server initiative, a teleconference was held in 18 July 2012 between the interested E/CAR States (Anguilla, Antigua and Barbuda, Barbados, Grenada, Saint Lucia, Saint Vincent, Sint Maarten, United States, Trinidad and Tobago and ECCAA) and an Ad-hoc Group was formed (Saint Lucia, ECCAA and Trinidad and Tobago, ICAO) to search for potential system display equipment compatible to display the merged radar image and/or process other ASTERIX categories of data.

2.   SCOPE AND OBJECTIVE OF THIS RFI

2.1   The scope and objective of this document is to provide the minimum technical/operational features (Design, Supply, Delivery, Installation, Testing and Commissioning) and characteristics of the radar data displays to be implemented as end-user equipment. The local site requirements shall be defined based on each site specific environment.

2.2   The radar displays will serve as a support to the air traffic control operation, as a radar monitor, and not for actual radar control at the following locations:

State / Territory	No. of Data Displays	Site
Anguilla	1	Airport Control Tower
Antigua & Barbuda/ECCAA	2	Antigua: Airport Control Tower and Approach Control Room
Dominica	1	Melville Hall: Airport Control Tower
Grenada	2	Maurice Bishop: Airport Control Tower and Approach Control Room
Montserrat	1	Airport Control Tower
Saint Vincent and the Grenadines	1	Airport Control Tower

2.3   The display will present the multiradar system information from PIARCO ACC where correlated (flight Plan information) and non-correlated radar tracks will be available.

2.4   The radar shall use the E/CAR AFS Network as the medium of transportation. 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.

2.5   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.   PROJECTED SCENARIO

3.1   Under the radar Data Server initiative, Trinidad and Tobago will collect the surveillance information (radar feeds) from the Martinique and Guadeloupe radars (monoradar and multiradar), Barbados and Trinidad, Tobago and any other available useful radar feed, process the information via multi sensor fusion on the PIARCO Air Traffic Management (ATM) system and then disseminate the data to the E/CAR states on the new E/CAR AFS network via a Cadmos ST media switch unit to all E/CAR States/territories that request this information.

3.2   The PIARCO 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.

3.3   During the E/CAR/NTG Meetings, it was noted that in the existing E/CAR AFS Network, the MPLS Network, several radar data circuits had been planned but also it was concluded the MPLS Network has sufficient capacity and flexibility to satisfy any new radar data requirement.

4.   GENERAL REQUIREMENTS

4.1   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.

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

4.3   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.

4.4   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.

5. **TECHNICAL REQUIREMENTS**

5.1   The radar displays 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.

5.2   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.

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

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

5.5   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.

5.6   The equipment shall be capable of the following:

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

5.7   Basic software features:

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

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

5.9   Display RADAR Map information

5.10   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

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

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

5.13   The following features (minimum requirements) shall be available on the RADAR Display:

  a)   RADAR track identification and display;
  b)   RADAR data monitoring;
  c)   Aircraft identification, automatic and manual SSR code correlation
  d)   Graphic tools interaction;
  e)   Alarms and warnings (STCA, MSAW, DAIW, RVSM, MTCD, etc.);
  f)   Operational data management;

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

5.15   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.

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

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

5.17   The RADAR 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.

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

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

5.20   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:

a) Two overlapping labels if any, shall automatically separate when controllers select automatic function (auto rotation); or

b) Controllers shall be able directly change track label position by clicking/releasing the mouse-buttons (manual rotation)

c) 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.

6.   PROJECT SERVICES

6.1   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; and
f) Warranty Services.

6.2   RISK MANAGEMENT

6.2.1   The Supplier will 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.

6.3   PROGRESS REVIEWS AND REPORTS

6.3.1   Progress reviews will be held once every month. If needed, Customer participation will be requested via phone or videoconference methods. A Progress Report will be issued after each Progress Review. It will keep track of major project events and of the decisions agreed between the Project Managers.

6.4   CUSTOM CLEARANCE AND PACKAGING

6.4.1   International Commercial Terms

6.4.1.1   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.)

6.4.2   Packaging

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

6.4.2.2   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.

6.4.2.3   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.

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

6.4.2.5   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.

6.5   SYSTEM INSTALLATION

6.5.1   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.

6.5.2   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.

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

6.6   WORK STATEMENT

6.6.1   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.

6.7   MAINTENANCE PROCEDURES AND STANDARDS

6.7.1   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.

6.8   REDUNDANCY, FAULT TOLERANCE AND RECOVERY

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

6.8.2   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.

6.8.3   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.

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

6.8.5   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.

6.8.6   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.

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

6.8.8   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.

6.8.9   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.

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

6.8.11   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.

6.9   SYSTEM RELIABILITY, AVAILABILITY AND MAINTAINABILITY

6.9.1   System Reliability

6.9.1.1   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.

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

6.9.1.3   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.

6.9.1.4   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.

6.9.2   Hardware Maintainability

6.9.2.1   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.

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

6.9.2.3   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.

6.9.3   Software Maintainability

6.9.3.1   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.

6.9.3.2   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.

6.9.4   Notification

6.9.4.1   Supplier shall propose a SMS text message notification to predefined mobile telephone numbers for major faults and catastrophic failures. Tenderer shall describe his interpretation of major faults and catastrophic failures.

7.   **GLOSSARY OF EASTERN CARIBBEAN RADAR DATA SHARINGS AND ABBREVIATIONS**

ADS-B	Automatic dependent surveillance - broadcast
AFS	Aeronautical fixed service
ANP	Air Navigation Plan
APP	Approach Control Service
ARTCC	Air Route Traffic Control Center
ATC	Air Traffic Control
ATN	Aeronautical Telecommunication Network
ATM	Air Traffic Management
BER	Bit Error Rate
CAA	Civil Aviation Administration
CAR	Caribbean Region
CAR/SAM	Caribbean/South America region
CDR	Call Detail Records
COTS	Commercial Off The Shelf
ICAO	International Civil Aviation Organization
IP	Internet Protocol
kbps	Kilobits per second
RFI	Request For Information
SARPs	Standards and Recommended Practices
SDP	Service Delivery Point
TMG	Technical Management Group
UPS	Uninterruptable Power Supply