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North American, Central American and Caribbean Office (NACC)
**Fourth Eastern Caribbean Network Technical Group and Second Eastern
Caribbean Radar Data Sharing Adhoc Group Meetings**
(E/CAR/NTG/4- E/CAR/RD/2)
Martinique, French Antilles, France, 17 to 18 June 2013

Agenda Item 3: Radar Data Sharing Activities

3.2 Operational requirement review

OPERATIONAL REQUIREMENTS REVIEW FOR RADAR DISPLAY USE

(Presented by ECCAA)

SUMMARY	
This working paper provides several operational considerations for using the radar data display for situational awareness.	
References:	
<ul style="list-style-type: none">• ICAO Doc 4444 (PANS – ATM) Air Traffic Management• ICAO Doc 9426 Air Traffic Services Planning Manual• Thirty-third Eastern Caribbean Working Group Meeting (E/CAR/WG/33) Meeting, Christ Church, Barbados from 4 to 8 June 2012.	
<i>Strategic Objectives</i>	<i>This working paper is related to Strategic Objectives: A. Safety – Enhance global civil aviation safety C. Environmental Protection and Sustainable Development of Air Transport</i>

1. Introduction

1.1 There are many benefits to be realized with radar data being displayed in the various ATC units in the OECS. The benefits include enhanced air traffic management which subsequently provides a safer operation of the service. The use of the data can either be for the purpose of full radar control or situational awareness. The decision as to how the data may be used will be driven the operational requirement of each unit which is based on the traffic volume.

2. Operational Requirements

Provision of ATS Surveillance Services

2.1 Situation awareness like the one achieved with radar data information, involves being aware of what is happening in the vicinity, in order to understand how information, events, and one's own actions will impact goals and objectives, both immediately and in the near future. One with an adept sense of situation awareness generally has a high degree of knowledge with respect to inputs and outputs of a system, i.e. an innate "feel" for situations, people, and events that play out due to variables the subject can control. Lacking or inadequate situation awareness has been identified as one of the primary factors in accidents attributed to human error. Thus, situation awareness is especially important in work domains where the information flow can be quite high and poor decisions may lead to serious consequences like in ATS.

2.2 The provision of radar in a State is generally done on a progressive basis. It is therefore important that the first installation of such equipment should be seen within an over-all plan which will grow as more radars are provided. For a tower performing a combined aerodrome/approach control function, where APP is equipped with radar and operated from the cab, there may be an additional requirement for special screening of the radar displays to minimize reflections and glare. This special screening may be required despite the use of daylight radar displays

2.3 The safe and efficient utilization of the airspace is the primary objective of ATS. To this extent, air traffic rules are developed and the use of the airspace is organized. ATS also develops the procedures necessary for a safe and efficient system of ATC and specifies the facilities, accommodation and equipment required to accomplish this. This includes all types of communications equipment, including radar and other visual and electronic aids to navigation.

2.4 The information provided by ATS surveillance systems like the radar and presented on a situation display may be used to perform the following functions in the provision of air traffic control service:

- a) provide ATS surveillance services as necessary in order to improve airspace utilization, reduce delays, provide for direct routings and more optimum flight profiles, as well as to enhance safety;
- b) provide vectoring to departing aircraft for the purpose of facilitating an expeditious and efficient departure flow and expediting climb to cruising level;
- c) provide vectoring to aircraft for the purpose of resolving potential conflicts;
- d) provide vectoring to arriving aircraft for the purpose of establishing an expeditious and efficient approach sequence;
- e) provide vectoring to assist pilots in their navigation, e.g. to or from a radio navigation aid, away from or around areas of adverse weather;
- f) provide separation and maintain normal traffic flow when an aircraft experiences communication failure within the area of coverage;
- g) maintain flight path monitoring of air traffic;
- h) Note— Where tolerances regarding such matters as adherence to track, speed or time have been prescribed by the appropriate ATS authority, deviations are not considered significant until such tolerances are exceeded;

- i) when applicable, maintain a watch on the progress of air traffic, in order to provide a procedural controller with:
 - i) improved position information regarding aircraft under control;
 - ii) supplementary information regarding other traffic; and
 - iii) information regarding any significant deviations by aircraft from the terms of their respective air traffic control clearances, including their cleared routes as well as levels, when appropriate.

2.5 Information derived from ATS surveillance systems, including safety-related alerts and warnings such as conflict alert and minimum safe altitude warning, should be used to the extent possible in the provision of air traffic control service in order to improve capacity and efficiency as well as to enhance safety.

2.6 The number of aircraft simultaneously provided with ATS surveillance services shall not exceed that which can safely be handled under the prevailing circumstances, taking into account:

- a) the structural complexity of the control area or sector concerned;
- b) the functions to be performed within the control area or sector concerned;
- c) assessments of controller workloads, taking into account different aircraft capabilities, and sector capacity; and
- d) the degree of technical reliability and availability of the primary and backup communications, navigation and surveillance systems, both in the aircraft and on the ground.

2.7 The controller shall adjust the situation display(s) and carry out adequate checks on the accuracy thereof, in accordance with the technical instructions prescribed by the appropriate authority for the equipment concerned.

2.8 The controller shall be satisfied that the available functional capabilities of the ATS surveillance system as well as the information presented on the situation display(s) is adequate for the functions to be performed.

2.9 The controller shall report, in accordance with local procedures, any fault in the equipment, or any incident requiring investigation, or any circumstances which make it difficult or impractical to provide ATS surveillance services.

2.10 Standard instrument departure and arrival routes should be designed so as to permit aircraft to navigate along the routes without radar vectoring. In high density terminal areas, where complex traffic flows prevail due to the number of aerodromes and runways, radar procedures may be used to vector aircraft to or from a significant point on a published standard departure or arrival route, provided that:

- a) procedures are published which specify the action to be taken by vectored aircraft in the event of radio communication failure, and
- b) adequate ATC procedures are established which ensure the safety of air traffic in the event of radar failure.

Situation Display

2.11 Radar display is known as an electronic display of radar-derived information depicting the position and movement of aircraft. Radar monitoring is the use of radar for the purpose of providing aircraft with information and advice relative to significant deviations from nominal flight path.

2.12 A situation display providing surveillance information to the controller shall, as a minimum, include position indications, map information required to provide ATS surveillance services and, where available, information concerning the identity of the aircraft and the aircraft level.

2.13 The ATS surveillance system shall provide for a continuously updated presentation of surveillance information, including position indications. Position indications may be displayed as:

- a) individual position symbols, e.g. PSR, SSR and ADS-B symbols, or combined symbols;
- b) PSR blips; and
- c) SSR responses.

2.14 When applicable, distinct symbols should be used for presentation of:

- a) unintentionally duplicated SSR codes and/or aircraft identification that are unintentionally duplicated;
- b) predicted positions for a non-updated track; and
- c) plot and track data.

2.15 Where surveillance data quality degrades such that services need to be limited, symbology or other means shall be used to provide the controller with an indication of the condition. Reserved SSR codes, including 7500, 7600 and 7700, operation of IDENT, ADS-B emergency and/or urgency modes, safety-related alerts and warnings as well as information related to automated coordination shall be presented in a clear and distinct manner, providing for ease of recognition.

2.16 Labels associated with displayed targets should be used to provide, in alphanumeric form, relevant information derived from the means of surveillance and, where necessary, the flight data processing system. Labels shall, as a minimum, include information relating to the identity of the aircraft, e.g. SSR code or aircraft identification and, if available, pressure-altitude-derived level information. This information may be obtained from SSR Mode A, SSR Mode C, SSR Mode S and/or ADS-B.

2.17 Labels shall be associated with their position indications in a manner precluding erroneous identification by or confusion on the part of the controller. All label information shall be presented in a clear and concise manner.

E/CAR States interested in Radar Data exchange

2.18 The display of radar data in the busy ATC units in the OECS has been discussed for quite a number of years. The ATC units included mainly St. Lucia and Antigua. In 2000, Antigua completed installation of a SSR. However, the system was never operationalized for various reasons. Within the last five years, radar data was fed to the two airports in St. Lucia from the Martinique. In more recent times, other ATC units have expressed interest in obtain radar data under the E/CAR Radar Sharing Project.

2.19 Since the E/CAR/WG/33 Meeting, all of the ATC units have expressed interests in obtaining radar data under the E/CAR Radar Sharing Project. The table below summarizes the operational requirement of each ATC unit:

State/Territory	Use of Radar Data	Comments
Anguilla	Situational Awareness	
Antigua & Barbuda	Full Radar Control	It is anticipated that the Antigua radar would become operational by December 2014. The data could then be fed into the E/CAR network.
Dominica	Situational Awareness	
Grenada	Situational Awareness	
Montserrat	Situational Awareness	
St. Lucia	Situational Awareness	
St. Vincent and the Grenadines	Situational Awareness	

3. Suggested actions

3.1 The Meeting is invited to:

- a) take note of the operation consideration presented in this paper;
- b) adopt the necessary actions to ensure the appropriate operational use of the radar data display; and
- c) take any other action the meeting considers appropriate.