INTERNATIONAL CIVIL AVIATION ORGANIZATION
NORTH AMERICAN, CENTRAL AMERICAN AND CARIBBEAN OFFICE

TWENTY-SIXTH EASTERN CARIBBEAN INFORMAL WORKING GROUP MEETING
(26TH E/CAR IWG)

(Barbados, 3 to 7 June 2002)

Agenda Item 5: **CNS/ATM Developments**

5.1 Eastern Caribbean ATM/CNS Implementation Plan

EASTERN CARIBBEAN ATM/CNS IMPLEMENTATION PLAN

(Working Paper presented by Intercaribbean Aeronautical Communications Limited (IACL) on behalf of the following E/CAR States: *Antigua, Barbados, Dominica, Grenada, Montserrat, St. Kitts/Nevis, St. Lucia, St. Vincent & the Grenadines and Trinidad and Tobago*)

SUMMARY

This Working Paper presents an updated version of the E/CAR ATM/CNS Implementation Plan.

REFERENCES

- GREPECAS/4 Meeting Report, Conclusions 4/37 and 4/42 Conclusion 5/33 of GREPECAS/5 and Conclusion 8/33 of GREPECAS 8 Meeting.
- EASTERN CARIBBEAN DCA's 14 MEETING REPORT Conclusion 14/6 and Conclusion 23/23 of the 23rd meeting of the E/CAR Working Group.

1 Introduction

1.1 Conclusion 4/42 of the GREPECAS/4 meeting report encourages states to develop national ATM/CNS transition plans. The E/CAR States tasked Intercaribbean Aeronautical Communications Limited to coordinate the development of the ATM/CNS plan for the sub-region.

2. Discussion

2.1 The E/CAR ATM/CNS Implementation Plan was developed using the Trinidad and Tobago National Plan as the basis and incorporates the National Plans (**Appendices E-L**) of the other above mentioned states, with the exception of the French Antilles. The Montserrat Plan will have to be revised as there is now a Heliport.

2.2 The terms of reference for the plan outlined in conclusion 4/42 of the GREPECAS/4 and GREPECAS/8 meeting reports are:-

> *"The E/CAR ATM/CNS plan should be consistent with the regional plan approved via conclusion 5/33 of the GREPECAS/5 meeting report. The E/CAR ATM/CNS plan should allow for easy coordination within the sub-region and with adjacent regions."*
>
> *"The E/CAR ATM/CNS Plan format should conform to the ICAO CAR/SAM Regional ATM/CNS Plan and all elements of ATM/CNS should be included."*

2.3 The E/CAR Plan was accepted at the ATM/CNS/SG1 held in California 16-20 July 2001, and reviewed by the E/CAR ATS Committee at the 7th Meeting held in Port of Spain on 1 - 3 October 2001.

2.4 The Plan was also presented to and noted by the DCA's at the 17th Meeting held in Port of Spain 4-7 December 2001.

3. **Action**

3.1 States should report on the implementation of any of the items in their plans.

3.2 The Working Group should carry out the annual review of the Plan as mandated by Conclusion 14/6 of the DCAs 14th Meeting which was held in Puerto Rico 9-12 June 1998.

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INTERNATIONAL CIVIL AVIATION ORGANIZATION

EASTERN CARIBBEAN ATM/CNS TRANSITION PLAN

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7th November, 2001

1.0 INTRODUCTION

1.1 The E/CAR States have recognized the increasing limitations of the present air navigation system and the improvements needed to take civil aviation into the 21st century. The limitations of the present system are intrinsic to the system itself, and the problems cannot be overcome unless the E/CAR States embark on a new communications, navigation and surveillance (CNS) system to support future enhancements in air traffic management (ATM). The E/CAR States are also cognizant that implementation of the concept would require regional coordination and planning. The ATS Committee was established to, among other things, oversee aspects pertaining to the ATM/CNS Transition Plan.

1.2 The scope of the E/CAR ATM/CNS Transition Plan includes the airspace designated to the E/CAR States.

1.3 The E/CAR ATM/CNS Transition Plan outlines the current system limitations, the future ATM/CNS system components, applications and benefits, and the anticipated implementation timetable. Note that although this regional ATM/CNS Transition Plan can be used for general guidance of the E/CAR as a whole, it is advised that each State develop its own ATM/CNS implementation plan that is specific to its controlled airspace and in line with this regional plan.

2.0 BACKGROUND

2.1 Conclusion 4/37 of GREPECAS/4, relating to the preparation of national plans for the transition to the new ATM/CNS system, taking into account the established guidelines in the CAR/SAM. ATM/CNS Regional Plan. It was noted that Sub-Regional Plans must allow for easy coordination with adjacent Regions.

The fourth GREPECAS Meeting, held in Panama City (1994 September 20-26) approved the DRAFT CAR/SAM ATM/CNS Transition Plan prepared by the ATM/CNS Sub-Group, by means of Conclusion 4/38.

3.0 CURRENT SYSTEM LIMITATIONS

(The following information is provided in tabular form in Appendix A.)

3.1 Communications

3.1.1 Controller-Pilot

a. Systems in use: VHF and HF voice.
b. System limitations: VHF coverage gaps, VHF/HF reliability, atmospheric interference (HF), frequency congestion, language difficulties.

3.1.2 Controller-Controller

a. Systems in use: AFTN, land-line.
b. System limitations: inadequate availability and reliability.

3.2 Navigation

3.2.1 Systems in use

a. En route navigation is supported by VOR/DME, NDB, INS/IRS, Omega (until 9/1997), Loran C and barometric altimetry.
b. Approach navigation is supported by VOR/DME, NDB, ILS.

3.2.2 System limitations

a. Aircraft that rely on VOR/DME/NDB for en route navigation are obliged to use a relatively inefficient route structure tied to Navaid location.
b. Navaid range is limited.
c. Navaid reliability is hindered by outages.
d. Navaid accuracy is not optimized for en route (NDB) or instrument approach (VOR and NDB).
e. Navaid purchase price and maintenance costs inhibit broad implementation.

3.3 Surveillance

3.3.1 Systems in use

a. Voice position reports.
b. PSR/SSR (Mode C).

3.3.2 System limitations

a. Position report accuracy is not optimal.
b. PSR/SSR coverage is limited. Procedural separation is inefficient in non-radar area.
c. PSR/SSR is limited by line of sight.
d. Widespread implementation is inhibited by high equipment cost.

3.4 Air Traffic Management

3.4.1 Systems in use: ICAO standards and recommended practices (SARPS) are used in conjunction with available equipment.

3.4.2 System limitations

a. Lack of adequate radar coverage.
b. Airspace configuration.
c. Dissimilar ATS procedures.
d. Unreliable communication facilities and language difficulties.
e. Uncoordinated provision and implementation of present CNS equipment.

4.0 FUTURE ATM/CNS SYSTEM COMPONENTS, APPLICATIONS, BENEFITS

4.1 General

4.1.1 Following is a review of the components and applications that will comprise the fully implemented ATM/CNS system, as well as the benefits provided. The component/application information is presented in tabular form in Appendix B, the benefit information is presented in tabular form in Appendix C.

4.2 Communication

4.2.1 Controller-Pilot

a. Voice communication (VHF/HF/SATCOM) will be used primarily for time critical information such as traffic avoidance vectors and landing clearances at busy airports. Voice communications will also serve as a backup for data link communication (VHF/HF/SATCOM).

b. Data link communication (VHF/HF/SATCOM) will be used for routine information that is not time critical, e.g. pre-departure clearances, push back/taxi clearances, airborne re-touring requests/clearances, weather and NOTAMS. This Controller-Pilot Data Link (CPDLC) network will maximize efficiency, and reduce miscommunications and frequency congestion. The system design will ensure fault free data link communication, as well as data security.

4.2.2 Controller-Controller

a. Controller-Controller Data Link (AIDC) will be used to communicate flight activity and resolve conflicts/alerts. The system design will ensure fault free data link communication, as well as data security.

4.2.3 All Controller-Pilot and Controller-Controller Communications

a. The Aeronautical Telecommunication Network (ATN) will provide global and data inter-connectivity.

4.3 Navigation

4.3.1 The Global Navigation Satellite System (GNSS) will enhance safety by improving the pilots' position/situational awareness, reducing pilot workload, and enhancing navigational accuracy. Accordingly, GNSS is expected to reduce the potential for controlled flight into terrain (CFIT).

4.3.2 GNSS provides highly accurate and reliable navigation around the globe. Greater accuracy will enable a reduction in separation standards, increased capacity and potentially lower landing minima at airports served by only non-precision approaches. Greater reliability will reduce delays and cancellations caused by inoperative ground based en-route and approach Navaids.

4.3.3 Instrument approach capability will be possible at airports where this was not possible previously due to Navaid siting problems or cost. GNSS and its augmentation technologies

provide 4-dimensional guidance (latitude, longitude, altitude and time) that is not currently available with most non-precision approach navigation aids. GNSS increases flight safety by providing a precision approach capability to many airports previously served by only non-precision approaches.

4.3.4 On board direct from-any-to-anywhere capability will enable optimized routes and instrument approach procedures, and a reduction in user operating costs.

4.4 Surveillance

4.4.1 Global surveillance will be possible by down linking GNSS aircraft position to ATS providers.

4.4.2 In the long run, users will be able to install Cockpit Display of Traffic Information (CDTI) equipment to enhance traffic awareness and safety.

4.5 Air Traffic Management

4.5.1 The role of ATS providers will shift from active traffic control to traffic management, with intervention when necessary to avoid conflicts.

5.0 EASTERN CARIBBEAN ATM/CNS TRANSITION TIMETABLE

5.1 Guiding Principles

5.1.1 The E/CAR ATM/CNS Transition Plan recognizes several guiding principles.

a. The plan must be practical and progressive in its implementation.
b. Each step of the transition will necessarily undergo a trial and demonstration phase, followed by a certification/approval process, which produces at operational introduction phase.
c. Early benefits must be achievable, measurable, and in reasonable step with investment.
d. A high degree of seamless-ness and inter-regional and intra-regional coupling must be achieved.
e. Synchronization of the airline plan with the ICAO ATM/CNS CAR/SAM Regional Implementation Plan must be maintained to ensure that benefits will materialize.
f. The real regional environment and operating realities must be recognized.

5.2 Implementation Periods

5.2.1 Three general stages are contemplated

TIMING	FOCUS
Near term – 1998-2001	GNSS Trials and Demonstrations and early implementation of basic GPS NAV services.
Mid term –2002-2005	Continue navigation application. Early implementation of communications elements.
Long term –2006-2010	Continue navigation and communications applications. Implementation of Surveillance and ATM.

5.2.2 The focus of the Near Term Plan is GNSS Trials and Demonstrations, followed by early implementation by lead States. This focus stems from the availability of a substantial portion of the GNSS system, and the probability that GNSS will produce early safety and operating benefits cost effectively. A regional GNSS trial and demonstration, designed to give the civil aviation authorities operational experience and early benefits to the users, is entering its second year. Numerous GPS routes have been developed. WGS-84 airport surveys have been completed for nearly all E/CAR States. Stand-alone non-precision approaches have been developed using the new survey data. The Caribbean GNSS Trial And Demonstration Plan, which outlines the approved operations and requirements, is provided in Appendix D ATM/CNS Implementation Timetable.

5.2.3 GNSS will be used extensively for en-route and non-precision approach navigation during the Mid Term. WAAS and GBAS (LAAS) precision approaches will be introduced. Implementation of the RNP Concept will lead to reduce longitudinal and lateral separation significantly. Likewise the implementation of the RVSM concept will result in reduced vertical separation. The Mid-term will also see early introduction of Controller-Pilot data link (CPDLC) using VHF and HF.

5.2.4 During the first part of the Long Term period navigation and communication applications will be widely implemented and CPDL communication and ADS surveillance will proliferate. Air Traffic Management concepts designed to increase system capacity, efficiency and safety will progress. As the Long Term period proceeds, ATM/CNS components and applications will mature toward full implementation, including completion of the Aeronautical Telecommunications Network.

Decommissioning and removal of conventional ATM/CNS systems and ground-based navigation aids that are deemed redundant and unnecessary will proceed after full implementation, but taking into consideration factors such as new system performance, user acceptance and user equipage.

5.3 Near Term

5.3.1 Communication

a. Availability of VHF and Voice Position Reports
b. Improved AFS for the E/CAR
c. HF Voice

d. VHF Data Link
e. AIDC
f. ATN
g. ATIS
h. HF Data link
i. Better than ATN Compliant
j. AMSS Data voice

5.3.2 Navigation

a. Availability of NDB
b. VOR/DME
c. Barometric altimetry
d. GNSS Navigation
e. Utilization of ILS
f. FMS/FMCS procedures
g. WGS 84

5.3.3 Surveillance

a. Continued use of voice position reports
b. Availability of Monopulse SSR (Mode A/C)
c. Mandatory carriage of transponders (Mode C)
d. Linking of Existing and Proposed Radars
e. MSSR to SSR Mode S
f. ADS
g. ADS/B to be determined

5.3.4 Air Traffic Management

(i)Airspace Management

a. Fixed RNAV ATS Routes
b. Random RNAV Routes
c. Application of RNP Concepts
d. Optimized sectorization
e. Application of Required Communication Performance (RCP)-TBD
f. Application of Required Surveillance Performance (RSP)-TBD

(ii)Air Traffic Services

a. Reduced Vertical Separation Minima (RVSM) – To be determined
b. Reduced Longitudinal Separation
c. Reduced Lateral Separation
d. Autonomous Flight – To be determined
e. Minimum Safe Altitude Warning (MSAW)

(iii)Air Traffic Flow Management (ATFM)

a. Evaluation of current ATM Capacity
b. Establishment of ATFM Data Bases

(iv)Human Factors

a. Dissemination of Information on ATM/CNS Concepts
b. Instruction and Training
c. Dissemination of Human Aspects of ATM/CNS

5.4 **Medium Term**

5.4.1 Communication

a. Availability of VHF and Voice Position Reports
b. HF voice
c. VHF data link
d. AIDC
e. ATN
f. HF Data Link
g. AMSS Data Voice
h. AFTN/ATN Gateway
i. ATN (ATS ES/Router)
j. FANS 1 or equivalent

5.4.2 Navigation

a. NDB
b. VOR/DME
c. Barometric altimetry
d. GNSS Navigation
e. FMS/FMCS procedures
f. Utilization of ILS
g. WGS 84
h. SBAS
i. GBAS
j. INMARSAT Overlay

5.4.3 Surveillance

a. Continued use of voice position reports
b. Availability of PSR/SSR (Mode A/C)
c. SSR to SSR Mode S – To be determined
d. Mandatory Carriage of transponders (Mode C)
e. Linking of Existing and proposed radars
f. Mandatory use of ACAS
g. ADS
h. ADS/B – To be determined

5.4.4 Air Traffic Management

(i)Airspace Management

a. Fixed RNAV ATS Routes
b. Random RNAV Routes

c. Application of RNP Concepts
d. Sector Boundaries Transparent to users
e. Optimized Sectorization
f. Application of RCP – To be determined
g. Application of RSP – To be determined

(ii)Air Traffic Services
a. Reduced Vertical Separation Minima (RVSM) – To be determined
b. Reduced Longitudinal Separation
c. Reduced Lateral Separation
d. Conflict predictions
e. Conflict Alert
f. Minimum Safe Altitude Warning (MSAW)
g. Windshear Detection
h. RNAV SIDS and STARS
i. Autonomous Flight – TBD

(iii)Air Traffic Flow Management (ATFM)
a. Interregional Cooperative ATFM
b. Establishment of ATFM Data Bases
c. Application of Strategic ATFM
d. Application of PRE-TACTICAL ATFM
e. Application of TACTICAL ATFM

(iv)Human Factors
a. Dissemination of Information ATM/CNS Concepts
b. Instruction and Training
c. Dissemination of Human Factors of ATM/CNS

5.5 Long Term

5.5.1 Communication
a. Availability of VHF and voice position reports
b. VHF data link
c. HF data link
d. AMSS data/voice
e. AIDC
f. ATN
g. AFTN/ATN Gateway
h. ATN (ATS ES/Router)
i. FANS 1 or Equivalent

5.5.2 Navigation
a. GNSS Navigation
b. Barometric altimetry
c. FMS/FMCS Procedures
d. Utilization of ILS

e. WGS 84
f. SBAS
g. GBAS
h. INMARSAT Overlay

5.5.3 Surveillance

a. Continued utilization of voice position reports
b. Availability of MSSR (Mode A/C)
c. MSSR to MSSR Mode S – To be determined
d. Linking of existing and proposed E/CAR Radars
e. Mandatory Carriage of Transponders (Mode C)
f. Mandatory use of ACAS (Airborne Collision Avoidance System)
g. ADS
h. ADS/B – To be determined

5.5.4 Air Traffic Management

(i)Airspace Management

a. Fixed RNAV ATS Routes
b. Random RNAV Routes
c. Application of RNP Concepts
d. Sector Boundaries Transparent to users
e. Optimized Sectorization
f. Application of Required Communication Performance (RCP) – TBD
g. Application of Required Surveillance Performance (RSP) – TBD

(ii)Air Traffic Services

a. Reduced Vertical Separation Minima (RVSM) – To be determined
b. Reduced Longitudinal Separation
c. Reduced Lateral Separation
d. Conflict Predictions
e. Conflict Alert
f. Windshear Detection
g. RNAV SIDS AND STARS
h. Minimum Safe Altitude Warning (MSAW)
i. Airborne Separation Assurance Systems (ASAS)
j. Autonomous Flight

(iii)Air Traffic Flow Management (ATFM)

a. Interregional Cooperative ATFM
b. Establishment of ATFM Data Bases
c. Application of Strategic ATFM
d. Application of Pre-Tactical ATFM
e. Application of Tactical AFTM
f. ATFM Data Link Service

(iv)Human Factors

a. Dissemination of Information ATM/CNS Concepts
b. Instruction and Training
c. Dissemination of Human Aspects of ATM/CNS

E/CAR ATM/CNS TRANSITION PLAN

APPENDIX A: CURRENT SYSTEM LIMITATIONS

ITEM	PHASE OF FLIGHT				
	 PRE-DEPARTURE TAXI AND TAKE OFF	 CLIMB AND DEPARTURE TRANSITION	 ENROUTE	 DESCENT AND ARRIVEL TRANSITON	 APPROACH LANDING AND TAXI
COMMUNICATION					
Current Systems Controller-Pilot	• VHF voice	• VHF voice	• VHF voice • HF voice	• VHF voice	• VHF voice
Controller-Controller	• AFTN • Land line	• AFTN • Land line	• AFTN • Land Line	• Teletype (AFTN) • Land line	• AFTN • Land line
System Limitation • VHF voice	• Coverage gaps in remote areas (mountain, jungle), lagging infrastructure, frequency congestion at largest airports				
• HF voice	• Susceptible to interference, unreliable operation/service				
• AFTN	• Inefficient, unreliable, lagging infrastructure				
NAVIGATION					
Current Systems		• VOR DME NDB INS IRS OMEGA FMS	• VOR DME NDB INS IRS OMEGA FMS	• VOR DME NDB INS IRS OMEGA FMS	• ILS VOR DME NDB NOTE: MLS not planned
System Limitations		• Availability/reliability-VOR DME NDB • Accuracy-VOR DME NDB INS IRS OMEGA • RNAV limitations • OMEGA withdrawal • Facility siting limitation	• Availability/reliability-VOR DME NDB • Accuracy-VOR DME NDB INS IRS OMEGA • RNAV limitations • OMEGA withdrawal • Facility siting limitation	• Availability/reliability-VOR DME NDB • Accuracy-VOR DME NDB INS IRS OMEGA • RNAV limitations • OMEGA withdrawal • Facility siting limitation	• Availability/reliability-VOR DME NDB • Accuracy-VOR DME NDB • High cost–ILS • Facility siting limitation • System limitation - ILS

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APPENDIX A: CURRENT SYSTEM LIMITATIONS

ITEM	PHASE OF FLIGHT				
	 PRE-DEPARTURE TAXI & TAKE OFF	 CLIMB & DEPARTURE TRANSITION	 ENROUTE	 DESCENT & ARRIVAL TRANSITION	 APPROACH LANDING & TAXI
SURVEILLANCE					
Current Systems	• Visual	• Primary radar • Secondary radar	• Primary radar • Secondary radar	• Primary radar • Secondary radar	• Primary radar • Secondary radar • Visual
System Limitations • Visual • Primary radar • Secondary radar	• Range, line of sight • Availability, reliability, range, cost • Availability, reliability, range, cost				
AIR TRAFFIC CONTROL					
Current System	• ICAO SARPS • Radar and procedural separation	• ICAO SARPS • Radar and procedural separation	• ICAO SARPS • Radar and procedural separation	• ICAO SARPS • Radar and procedural separation	• ICAO SARPS • Radar and procedural separation
System Limitations		• Inability to support efficient routings • Communication/language problems • Reactive • Accuracy • Traffic capacity • Communication dependent	• Inability to support efficient routings • Communication/language problems • Reactive • Accuracy • Traffic capacity • Communication dependent	• Inability to support efficient routings • Communication/language problems • Reactive • Accuracy • Traffic capacity • Communication dependent	• Inability to support efficient routings • Communication/language problems • Reactive • Accuracy • Traffic capacity

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APPENDIX B: FUTURE ATM/CNS SYSTEM COMPONENTS AND APPLICATIONS

COMPONENTS	APPLICATIONS				
	 PRE-DEPARTURE TAXI & TAKE OFF	 CLIMB & DEPARTURE TRANSITION	 ENROUTE	 DESCENT & ARRIVAL TRANSITION	 APPROACH LANDING & TAXI
COMMUNICATIONS					
CONTROLLER-PILOT					
• VHF voice	• Used for time critical communications (e.g. take off clearance)				
• HF voice			• Used in remote/oceanic areas		
• SATCOM			• Used in remote/oceanic areas		
• Data Link (CPDLC) - Used by aircraft to:	• Obtain ATIS/NOTAMS, request engine start, push back, taxi clearances	• Request/forward weather reports • Request re-routings	• Request/forward weather reports • Request re-routings	• Obtain ATIS/NOTAMS • Request/forward weather reports • Request re-routings	
- Used by ATC to:	• Issue route, engine start, push back, taxi clearances	• Request/forward weather reports • Forward NOTAMS • Issue re-routings • Issue altimeter setting	• Request/forward weather reports • Forward NOTAMS • Issue re-routings • Issue altimeter setting	• Request/forward weather reports • Forward NOTAMS • Issue re-routings • Issue altimeter setting • Assign runway	
CONTROLLER-CONTROLLER					
• Data link (AIDC)	• Used to communicate flight activity and resolve conflicts/alerts	• Used to communicate flight activity and resolve conflicts/alerts	• Used to communicate flight activity and resolve conflicts/alerts	• Used to communicate flight activity and resolve conflicts/alerts	• Used to communicate flight activity and resolve conflicts/alerts
ALL AIR-GROUND & GROUND-GROUND					
• Aeronautical Telecommunication Network (ATN)	• Will be used to provide global, seamless voice and data inter-connectivity				

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APPENDIX B: FUTURE ATM/CNS SYSTEM COMPONENTS AND APPLICATIONS

COMPONENTS	**APPLICATIONS**				
	 PRE-DEPARTURE TAXI & TAKE OFF	 CLIMB & DEPARTURE TRANSITION	 ENROUTE	 DESCENT & ARRIVAL TRANSITION	 APPROACH LANDING & TAXI
NAVIGATION					
SPACE SEGMENT					
• GPS satellites (24) - May be used for supplemental navigation everywhere	• May be used for guidance following take off	• Must maintain conventional navigation capability (INS/IRS/OMEGA or remain within service volume of VOR/DME/NBC) • It is not necessary to display/monitor conventional guidance provided RAIM is available	• Must maintain conventional navigation capability (INS/IRS/OMEGA or remain within service volume of VOR/DME/NDB) • It is not necessary to display/monitor conventional guidance provided RAIM is available	• Must maintain conventional navigational capability (INS/IRS/OMEGA or remain within service volume of VOR/DME/NDB) • It is not necessary to display/monitor conventional guidance provided RAIM is available	• When executing GNSS Class III overlay approach it is not necessary to display or monitor the underlying navaid, and the navaid may be inoperative[1] • When executing GNSS stand alone approach there does not need to be any other approach available[1]
- May be used for primary navigation in remote/oceanic areas	• May be used for guidance following take off	• It is not necessary to maintain conventional navigation capability. Dual installations are required except in areas designated as single-long-range-navigation-receiver areas	• It is not necessary to maintain conventional navigation capability. Dual installations are required except in areas designated as single-long-range-navigation-receiver areas	• It is not necessary to maintain conventional navigation capability. Dual installations are required except in areas designated as single-long-range-navigation-receiver areas	• Same as above
• WAAS satellites	• Will permit primary means navigation in non-remote/oceanic areas and CAT 1 (or near CAT I) precision approaches in coverage area				
• GLONASS satellites	• Will provide compatibility and functionality similar to GPS satellites				

[1]Associated requirements: 1) RAIM must be available, 2) If destination weather required the filing of an alternate airport, the alternate must have a conventional approach which the aircraft is equipped to execute.

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APPENDIX B: FUTURE ATM/CNS SYSTEM COMPONENTS AND APPLICATIONS

COMPONENTS	**APPLICATIONS**				
	 PRE-DEPARTURE TAXI & TAKE OFF	 CLIMB & DEPARTURE TRANSITION	 ENROUTE	 DESCENT & ARRIVAL TRANSITION	 APPROACH LANDING & TAXI
GROUND SEGMENT					
• GPS ground station network	• Controls GPS satellites				
• WAAS ground station network	• Determines regional position error and relays same to aircraft via WAAS geo-stationary satellites				
• GLONASS ground station network	• Controls GLONASS satellites				
• GBAS (LAAS) reference stations.					• Provides precision approach capability: initially CATI, then CAT II and III
• WGS-84 surveys	• Since GNSS is based on the WGS-84 coordinate system, airports and obstructions must state in WGS-84 coordinates. In most cases this will require new surveys.				
AIRBORNE SEGMENT					
• GNSS receiver - RAIM - FDE - GPS/WAAS/Receiver	• This function monitors the integrity of satellite signals received and alerts pilot if: a) the signal of an unhealthy satellite is being received; or b) the ability to monitor integrity is lost (i.e. insufficient number of satellites is available) • This function detects a faulty satellite and excludes it from the position determination process • Used to receive the signal from WAAS Geosynchronous satellites and use this corrected GPS position for En Route, Non Precision and Precision operations.				
• Local area differential receiver					• Used to receive correction signals from local area differential ground stations

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APPENDIX B: FUTURE ATM/CNS SYSTEM COMPONENTS AND APPLICATIONS

COMPONENTS	APPLICATIONS		
SURVEILLANCE			
ADS	• Provides surveillance and surface traffic monitoring	• Provides surveillance in continental, remote and oceanic areas • Provides conflict search and resolution • Replaces ATC radar	• Provides surveillance and surface traffic monitoring
ADS-B	• Provides surveillance and surface traffic monitoring	• Provides surveillance in continental and non-remote areas • Provide conflict search and resolution • Replaces ATC radar	• Provides surveillance and surface traffic monitoring
AIR TRAFFIC MANAGEMENT			
RNP		• Users of selected high density airspace will be required to maintain a specified horizontal accuracy	
RVSM		• Vertical separation, above a specified flight level, will be reduced form 2000 ft. to 1000 ft. for approved aircraft	
RTA		• In certain airspace, appropriately equipped aircraft will be issued a required time of arrival at a specified fix in addition to route, altitude and airspeed clearances	
Air Traffic Flow Management	• Automated traffic management • Tactical and strategic conflict resolution • Capacity management		

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APPENDIX C: FUTURE ATM/CNS SYSTEM BENEFITS

ATM/CNS COMPONENTS	ATM/CNS BENEFITS				
	 PRE-DEPARTURE TAXI & TAKE OFF	 CLIMB & DEPARTURE TRANSITION	 EN ROUTE	 DESCENT & ARRIVAL TRANSITION	 APPROACH LANDING & TAXI
COMMUNICATION					
CONTROLLER-PILOT					
VHF voice	• Provides medium for time critical information (e.g. take off clearance). Provides back up for data link.				
HF voice		• Provides medium for time critical information such as traffic avoidance vectors. Provides back up for data link.			
SATCOM		• Provides medium for time critical information such as traffic avoidance vectors. Provides back up for data link.			
VHF data link (CPDLC)	• Maximizes efficiency and reliability of communications that are not time critical. Reduces miscommunications.				
HF data link (CPDLC)		• Provides medium for reliable, efficient, fault free communication of information that is not time critical. Reduces miscommunications.			
SATCOM data link (CPDLC)		• Provides medium for reliable, fault free communication of information that is not time critical. Reduces miscommunications.			
CONTROLLER-CONTROLLER					
AIDC	• Maximizes accuracy, efficiency, reliability				
ALL AIR-GROUND AND GROUND-GROUND					
ATN	• Maximizes accuracy, efficiency, reliability, connectivity				

E/CAR ATM/CNS TRANSITION PLAN

APPENDIX C: FUTURE ATM/CNS SYSTEM BENEFITS

COMPONENTS	BENEFITS				
	 PRE-DEPARTURE TAXI & TAKE OFF	 CLIMB & DEPARTURE TRANSITION	 ENROUTE	 DESCENT & ARRIVAL TRANSITION	 APPROACH LANDING & TAXI
NAVIGATION					
SAFETY All phases of flight: • Enhanced position awareness and reports • Reduced pilot work load	• Taxi way moving map display	• Enhanced navigation accuracy vs INS IRS OMEGA VOR NDG	• Enhanced navigation accuracy vs INS IRS OMEGA VOR NDB	• Enhanced navigation accuracy vs INS IRS OMEGA VOR NDB	• Enhanced navigation accuracy vs VOR NDB • Non-precision approach may be flown like precision approach, with pseudo glideslope and localizer. Some equipment permits horizon and vertical auto-pilot coupling.
EFFICIENCY Eventually one on board GNSS navigation system will replace the multiple navigation systems currently installed	• Shorter GNSS routes will permit reduced fuel loads and greater payloads	• Routing may be optimized • Positive course guidance may result in lower climb gradient and higher payload where terrain is a restricting factor	• Routing may be optimized • Greater navigation accuracy permits reduced horizontal and vertical separation standards, greater capacity	• 4D navigation capability will lead to more efficient arrival routes and increased capacity	• Non-precision (eventually precision) approaches can be developed for all suitable runways • Procedure turns may be eliminated • Missed approach holding point may be located so as to not interfere with other aircraft on approach
DEPENDABILITY	• Pre-departure satellite availability check ensures adequate satellite coverage	• FDE ensures satellite guidance is accurate • Signal reliability eliminates delays, cancellations due to inoperative ground based navaids	• FDE ensures satellite guidance is accurate • Signal reliability eliminates delays, cancellations due to inoperative ground based navaids	• FDE ensures satellite guidance is accurate • Signal reliability eliminates delays, cancellations due to inoperative ground based navaids	• FDE ensures satellite guidance is accurate • Signal reliability eliminates delays, cancellations due to inoperative ground based navaids

E/CAR ATM/CNS TRANSITION PLAN

APPENDIX C: FUTURE ATM/CNS SYSTEM BENEFITS

COMPONENTS	BENEFITS				
	 PRE-DEPARTURE TAXI & TAKE OFF	 CLIMB & DEPARTURE TRANSITION	 ENROUTE	 DESCENT & ARRIVAL TRANSITION	 APPROACH LANDING & TAXI
SURVEILLANCE					
EXPAND ADS and ADS-B	• Will enable application of ATN technology				
AIR TRAFFIC MANAGEMENT					
RNP	• Reduces terrain/obstacle clearance standards	• Reduces terrain/obstacle clearance standards • Reduces aircraft horizontal separation standards			• Reduces terrain/obstacle clearance standards
RVSM		• Increases system capacity / reduced vertical separation			
RTA		• Increases system capacity / time and conflict resolution			
Air Traffic Flow Management	• Increased airspace capacity • More efficient airspace utilization • Reduced controller workload • Enhanced safety • More efficient flight profiles • Improved conflict and alert resolution				

E/CAR ATM/CNS TRANSITION PLAN

APPENDIX D: ATM/CNS IMPLEMENTATION TIMETABLE

CNS Implementation Timetable	Short Term					Medium Term					Long Term			
COMMUNICATIONS	**97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**
Availability of VHF and Voice Position Reports														
Improved AFS for the ECAR														
HF Data Link (To Be Determined)														
AIDC														
HF Voice														
VHF Data Link														
AMSS Data Voice														
ATN														
BETTER THAN ATN COMPLIANT														
NAVIGATION	**97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**
FMS/FMCS Procedures														
Availability of NDBs														
Availability of VOR/DMEs														
Availability of Barometric Altimetry														
RNAV														
GNSS Navigation														
Utilization of ILS														
WGS 84														
SBAS														
GBAS														
INMARSAT OVERLAY														

SURVEILLANCE	97	98	99	00	01	02	03	04	05	06	07	08	09	10
Continued use of voice position reports														
Mandatory Carriage of Transponders Modes A/C														
MSSR to MSSR Mode S	To be determined													
Linking Existing and Proposed ECAR Radars														
Mandatory Use of ACAS														
ADS	To be determined													
ADS/B	To be determined													
Availability of MSSR (Mode A/C)														

E/CAR ATM/CNS TRANSITION PLAN

APPENDIX D: ATM/CNS IMPLEMENTATION TIMETABLE

ATM/CNS IMPLEMENTATION TIMETABLE	SHORT TERM				MEDIUM TERM					LONG TERM						
AIRSPACE MANAGEMENT	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**		
OPTIMIZED SECULARIZATION																
SECTOR BOUNDARIES TRANSPARENT TO USERS																
APPLICATON OF RNP CONCEPT																
APPLICATION OF RCP	To be determined															
APPLICATON OF RSP	To be determined															
ATM EVOLUTION	**MINIMUM ON BOARD REQUIREMENTS**							**MINIMUM GROUND REQUIREMENT SERVICES**							**IMP. DATE**	**REMARKS**
FIXED RNAV ATS ROUTES	RNAV CAPACITY RNPX CERTIFICATION DCPC VOICE (3)							RNPX PUBLICATION DCPC VOICE (1) (3) GROUND-GROUND SPEECH COM. (3)							2000 (4)	RNP CERTIFICAITON AND PUBLICATION WILL DEPEND ON AIRSPACE AND/OR ATS ROUTES CONCERNED. WHEN NECESSARY CIVIL/MILITARY COORDINATION FOR THE LOCATION/REDESIGN OF PROHIBITED AND RESTRICTED ZONES WILL BE REQUIRED.
RANDOM RNAV ROUTES	RNAV CPACITY RNPX CERTIFICATION DCPC VOICE (3)							RNPX PUBLICATION DCPC VOICE (1) (3) GROUND-GROUND SPEECH COM. (3)							2004 RIO/NY 2005 N./S. AMERICA EUROPE	RNP CERTIFICATION AND PUBLICATION WILL DEPEND ON AIRSPACE AND/OR ATS ROUTES CONCERNED. CIVIL/MILITARY AGREEMENT FOR FLEXIBLE USE OF AIRSPACE WILL BE REQUIRED.
AUTONOMOUS FLIGHT	To be determined							To be determined							To be determined	CONCEPT BEING DEFINED BY ICAO.
ENHANCED FLEXIBLE USE OF AIRSPACE	NAV CAPACITY ACCORDING TO AIRSPACE							DCPC VOICE								AGREEMENTS ARE REQUIRED TO OPTIMISE THE USE PROHIBITED AND RESTRICTED ZONES TO ACHIEVE AT

	DCPC VOICE (3) DATA LINK							GROUND-GROUND AIDC (3) SPEECH COM./AIDC COM. WITH MILITARY UNITS CIVIL/MILITARY COORDINATION AUTOMATION								ROUTES AS DIRECT AS POSSIBLE. DATABASE WILL CONTINUE INFORMATION SUCH AS AIRSPACE RESERVES, AERONAUTICAL INFORMATION, AERODROMES, TRAFFIC MET, SAR ETC.
AIR TRAFFIC SERVICES	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**		
MINIMUM SAFE ALTITUDE WARNING (MSAW)																
CONFLICT PREDICTION																
CONFLICT ALERT																
WINDSHEAR DETECTION																
RNAV/SIDS AND STARS																
CONFLICT RESOLUTION ADVICE																
FUNCTIONAL INTEGRATION OF GROUND STATIONS WITH AIRBOURNE SYSTEMS																
ATM EVOLUTION	**MINIMUM ON BOARD REQUIREMENTS**							**MINIMUM GROUND REQUIREMENT SERVICES**							**IMP. DATE**	**REMARKS**
LONGITITUDINAL SEPARATION																
10 MINUTE MINIMUM	NAV CAPACITY ACCORDING TO AIRSPACE DCPC VOICE (3)							DCPC (1) (3) GROUND-GROUND SPEECH COM. (3) NAV AIDS OR MINT APPLICATION							2003	HARMONIZE SEPARATION AT FIRS LIMITS.
USE OF 10-MIN. LONGITUDINAL SEPARATION USING MACH NUMBER TECHNIQUE AND/OR 80 NAUTICAL MILES RNAV – (NON RADAR ENVIRONMENT)	RNAV CAPACITY DCPC VOICE (3)							DCPC VOICE (1) (3) GROUND-GROUND SPEECH COM. (3) MNT APPLICATION 60" MAXIMUM POSITION INFORMATION							2001	PROCEDURES ARE CONTAINED IN DOC. 4444. ITS IMPLEMENTATION IS POSSIBLE AT ANY MOMENT AT THE DISCRETION OF THE STATES .
50 NAUTICAL MILES MINIMUM – (NON RADAR ENVIRONMENT)	FMS (2) RNP 10 CERTIFICATION DCPC VOICE (3)							RNP 10 PUBLICATION DCPC VOICE (1) GROUND-GROUND SPEECH COM. (3) MNT APPLICATION 30" MAXIMUM POSITION INFORMATION							2006	
30 NAUTICAL MILES MINIMUM – (NON RADAR ENVIRONMENT)	FMS (2) RNP 4 CERTIFICATION DCPC VOICE AND DATA ADS CAPACITY							RNP 4 PUBLICATIONS DCPC VOICE AND DATA GROUND-GROUND SPEECH COM. AND AIDC MNT APPLICATION ADS PRESENTATION							2008	CORRESPONDING SARPS NOT AVAILABLE for THIS SEPARATION.
LATERAL SEPARATION																

100 NAUTICAL MILES MINIMUM – (NON RADAR ENVIRONMENT)	RNP 20 CERTIFICATION DCPC VOICE (3)	RNP 20 PUBLICATION DCPC VOICE (1)(3) GROUND-GROUND SPEECH COM. (3)	RIO/NYC 2001 N/S AMERICA/ EUROPE	PARTIALLY IMPLEMENTED. RNP CERTIFICATION/PUBLIC A- TION PENDING. PARTIALLY IMPLEMENTED.
50 NAUTICALMILES MINIMUM – (NON RADAR ENVIRONMENT)	RNP 10 CERTIFICATION DCPC VOICE (3)	RNP 10 PUBLICATION DCPC VOICE (1) (3) GROUND-GROUND SPEECH COM. (3)	2006	
30 NAUTICAL MILE – (NON RADAR ENVIRONMENT)	RNP 4 CERTIFICATION DCPC VOICE AND DATA ADS	RNP 4 PUBLICATON DCPC VOICE AND DATE GROUND-GROUND SPEECH COM./AIDC ADS	2008	CORRESPONDING SARPS NOT AVAILABLE FOR THIS SPACING.
18 NAUTICAL MILES (BIDIRECTIONAL) – (NON RADAR ENVIRONMENT)	RNP 4 CERTIFICATION VHF DCPC VOICE	RNP 4 PUBLICATION VHF DCPC VOICE APPROPRIATE NAV INFRASTRUCTURE GROUND-GROUND SPEECH COM./AIDC (3)	To be determined	NON APPLICABLE IN COEANIC OR REMOTE AREA. PROCEDURES ARE CONTAINED IN DOC. 4444. ITS IMPLEMENTATION IS POSSIBLE AT ANYMOMENT AT THE DISCRETION OF STATES.
16.5 MINIMUM (UNDIRECTIONAL) – (NON RADAR ENVIRONMENT)	RNP 4 CERTIFICATION VHF DCPC VOICE	RNP 4 PUBLICATION VHF DCPC VOICE GROUND-GROUND SPEECH COM./AIDC (3) APPROP RIATE NAV INFRASTRUCTURE	To be determined	NON APPLICABLE IN OCEANIC OR REMOTE AREA PROCEDURES ARE CONTAINED IN DOC. 4444. ITS IMPLEMENTATION IS POSSIBLE AT ANY MOMENT AT THE DISCRETION OF STATES.
BETWEEN 10 AND 15 NAUTICAL MILES – (RADAR ENVIRONMENT)	RNP 5 CERTIFICATION VHF DCPC VOICE SSR TRANSPONDER	RNP 5 PUBLICATION VHF DCPC VOICE GROUND-GROUND SPEECH COM./AIDC (3) APPROPRIATE NAV INFRASTRUCTURE RADAR SURVEILLANCE	To be determined RION/NY N./S. AMERICA-EUROPE	SAFETY OF SYSTEM MUST BE EVALUATED, INCLUDING VOLUME FO WORK OF CONTROLLER. PROCEDURES ARE CONTAINED IN DOC. 4444. ITS IMPLEMENTATION IS POSSIBLE AT ANY MOMENT AT THE DISCRETION OSTATES (same as above) NON APPLICABLE IN OCEANIC OR REMOTE AREA
BETWEEN 8 AND 12 NAUTICAL MILES – (RADAR ENVIRONMENT)	RNP 4 CERTIFICATION VHF DCPC VOICE SSR TRANSPONDER	RNP 4 PUBLICATION VHF DCPC VOICE ROUND-GROUND SPEECH COM./AIDC (3) APPROPRIATE NAV INFRASTRUCTURE RADAR SURVEILLANCE	To be determined RIO/N.Y. N./S. AMERICA-EUROPE	SAFETY OF SYSTEM MUST BE EVALUATED, INCLUDING VOLUME OF WORK OF CONTROLLER PROCEDURES ARE CONTAINED IN DOC. 4444. ITS IMPLEMENTATION IS POSSIBLE AT ANY MOMENT AT THE DISCRETION OF STATES. (same as above) NON APPLICABLE IN OCEANIC OR REMOTE AREA.

REDUCED VERTICAL SEPARATION MINIMA																
RVSM ONE THOUSAND FEET BETWEEN FLIGHT LEVEL 290 AND 410	RVSM CERTIFICATION DCPC VOICE (3)							SUPERVISION OF SYSTEM PERFORMANCE DCPC VOICE (3) GROUND-SPEECH COM.							To be determined	REGIONAL AGREEMENT REQUIRED. REFER TO RVSM IMPLEMENTATION MANUAL DOC. 9574.
AIR TRAFFIC FLOW MANAGEMENT	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**		
EVALUATION OF CURRENT ATM CAPACITY																
APPLICATION OF PRE-TACTICAL ATFM																
APPLICATION OF TACTICAL ATFM																
APPLICATION OF STRATEGIC ATFM																
AIR TRAFFIC FLOW MANAGEMENT																
ATFM DATABASE/FLOW MANAGEMENT UNIT (FMU)	DATALINK							AUTOMATION VOICE AND DATA COM. (ICC)							2008	DATABASE WILL CONTAIN INFORMATION SUCH AS AIR SPACE RESERVES, AERONAUTICAL INFORMATION, AERODROMES, TRAFFIC, MET, SAR, ETC.
CENTRALISED ATFM	DATALINK							AUTOMATION VOICE AND DATA COM. (ICC)							2010	CENTRALISED ATFM REQUIRES A REGIONAL AGREEMENT. DATABASE WILL CONTAIN INFORMATION SUCH AS AIRSPACE RESERVES, AERONAUTICAL INFORMATION, AERODROMES, TRAFFIC, MET, SAR, ETC.
HUMAN FACTORS	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**		
DISSEMINATION OF INFO ATM/CNS CONCEPTS																
INSTRUCTION AND TRAINING																
DISSEMINATION OF HUMAN ASPECTS OF ATM/CNS																

1. SPEECH COMMUNICATIONS THROUGH A THIRD PARTY (AERONAUTICAL TELECOMMUNICATIONS STATION) AT THE CRITERION OF COMPETENT ATS AUTHORITY ON THE BASIS OF AN EVALUATION OF THE IMPACT OF THIS COMMUNICATION PROVISION OF ATS AND THE CONSEQUENT EFFECT OF THE SAFETY AIR OPERATIONS WITHIN THE AIRSPACE IN QUESTION.

2. IT IS ASSUMED THAT FMS AVAILABILITY INCLUDES RNAV CAPACITY.
3. for AIR TRAFFIC SERVICES, RADION TELEPHONY WILL BE USED IN AIR-GROUND COMMUNICATIONS AND COULD BE IMPROVED WITH DATA LINK
4. DATE REFERS TO IMPLEMENTATION OF NEW RNAV ROUTES WITH RNP REQUIREMENTS.
5.TRAFFIC IS CONSIDERED TO BE OF HIGH DENSITY WHEN 100 OR MORE AIRCRAFT OPERATE AT A GIVEN TIME WITHIN A CIRCLING HAVING A RADIUS OF 250 NAUTICAL MILES.

7th November, 2001

Appendix E

BARBADOS (ADAMS TMA) ATM/CNS IMPLEMENTATION

BARBADOS ATM/CNS TRANSITION PLAN

1. BACKGROUND

1.1 Barbados is very aware of the ever-increasing limitations of the present air navigation system and the improvements needed for civil aviation in the 21st century. These limitations cannot be overcome unless Barbados implements the new ICAO concept for communications, navigation and surveillance (CNS) systems to support the enhancement of air traffic management (ATM). Implementation of the CNS concept requires regional coordination and planning and every effort is being made to ensure that this plan is coordinated with the regional plan.

2. INTRODUCTION

2.1 The Draft CAR/SAM ATM/CNS Transition Plan prepared by the ATM/CNS Sub-group was approved at the fourth GREPECAS Meeting which, was held in Panama City from 20 -26 September 1994. That meeting also, in conclusion 4/42, required States to prepare national plans for the transition to the new ATM/CNS system, considering the general guidelines established in the Draft ATM/CNS Regional Plan. This Regional Plan must permit easy coordination within the region and also with adjacent Regions.

3. SCOPE

3.1 The Scope of the ATM/CNS Transition Plan for Barbados includes the airspace under the jurisdiction of Barbados.

3.2 The terms below will have the following meanings for the purposes of this plan.

Short Term	2001 to 2005
Medium Term	2006 to 2010
Long Term	2011 to 2015 and beyond.

4. CURRENT SITUATION/SHORT COMINGS

4.1 Communication

Air/ground Communication in Barbados' airspace is effected through VHF propagation.

4.2 Navigation

An NDB and a VOR/DME are utilised for navigation in the Terminal Control Area.

ILS and VOR/DME are used at Grantley Adams International Airport for approaches.

RNAV GPS Approaches are used as a secondary means.

4.3 Surveillance

Surveillance is achieved through Monopulse Secondary Surveillance Radar located one mile north of the airport.

5. Future ATM/CNS Systems

Barbados recognises that the ICAO ATM/CNS concept is being implemented globally and therefore accepts this concept.

A complete analysis of the present system has informed the following proposals for migration to ATM/CNS.

Communication

Short Term

1. Retain use of VHF Voice Communications
2. Implementation of improved AFS
3. Implementation of AIDC (ATS Inter-facility Data Communications)
4. Implementation of ATIS

Medium Term

1. Retain use of VHF Voice Communications
2. Implement ATN
3. Implement AIDC
4. Implement VHF Data Link
5. Continued use of ATIS

Long Term

1. Continued use of VHF Voice Communications
2. AMSS Data Voice
3. Continued use of ATIS

Navigation

Short Term

1. Continue to utilise FMS/FMCS Procedures
2. Continue to use NDB
3. Continue to use VOR/DME
4. Continue to use ILS
5. Continued use of GNSS Navigation Approaches

Medium Term

1. Continued use of FMS/FMCS Procedures
2. Continued use of NDB
3. Continued use of VOR/DME
4. Continued use of GNSS Navigation
5. Continued use of ILS

Long Term

1. Withdrawal of NDB
2. Continued us of FMS/FMCS Procedures
3. Withdrawal of VOR/DME
4. Continued use of GNSS Navigation
5. Continue use of ILS

Surveillance

Short Term

1. Mandatory carriage of transponder
2. Implementation of ADS to be determined
3. Minimum Safe Altitude Warning
4. Continued use of MSSR Mode C

Medium Term

1. Implementation of ADS to be determined
2. Continued use of MSSR Mode C
3. Upgrade of MSSR Mode C to Mode S

Long Term

1. Implementation of ADS to be determined
2. Continued use MSSR Mode S

Air Traffic Management

Short Term

1. Evaluation of current ATM Capacity
2. Dissemination of information on ATM/CNS Concepts
3. Continued instruction and training on ATM/CNS
4. Air Ground Data Link
5. Dissemination of human aspects of ATM/CNS

Medium Term

1. Wind shear Detection
2. Dissemination of information on ATM/CNS Concepts
3. Dissemination of human Aspects of ATM/CNS
4. Continued instruction and training on ATM/CNS
5. Application of ADS to be determined

Long Term

1. Wind shear Detection
2. Dissemination of information on ATM/CNS Concepts
3. Dissemination of human Aspects of ATM/CNS
4. Continued instruction and training on ATM/CNS
5. Application of ADS to be determined

18th March, 2002

Appendix F

COMMONWEALTH OF DOMINICA

ATM/CNS TRANSITION PLAN

1.0 INTRODUCTION

1.1 It is recognized that the present air navigation system serving the Eastern Caribbean States is flawed with problems and consequently is inadequate to take civil aviation into the 21st century. It is further recognized that the limitations of the present system are intrinsic to the system itself and the problems cannot be overcome unless states embark on a new communications, navigation and surveillance (CNS) system to support future enhancements in air traffic management (ATM). Implicit in this statement is the recognition that implementation of this concept would require regional co- ordination and planning. The proposed ATM/CNS transition plan seeks to give effect to that idea.

1.2 The Plan will focus on the current system limitations, the future ATM/CNS system components, applications and benefits, and the anticipated implementation timetable.

2.0 CURRENT SYSTEM LIMITATIONS

2.1 Communications

2.1.1 Controller-Pilot

a. System in use: VHF voices.
b. System limitations: VHF coverage gaps - Southern, south, eastern and western sections; VHF reliability; frequency congestion.

2.1.2 Controller-Controller

a. System in use: AFTN, land line.
b. System limitations: inadequate availability and reliability.

2.2 Navigation

2.2.1 System in use: N.D.B. for enroute navigation, homing and instrument approaches.

2.2.2 System limitations

a. Aircraft that rely on N.D.B. for enroute navigation are obliged to use a relatively inefficient route structure tied to navaid location.
b. Range is limited.

c. Reliability is limited by outages.
d. Signal can be erratic.
e. Purchase price and maintenance cost can be prohibitive.

2.3 Surveillance

2.3.1 System in use: Voice position reports, visual

2.3.2 System Limitations

Range is limited by line of sight.

2.4 Air Traffic Management

2.4.1 System in use: ICAO Standards and Recommended Practices (S.A.R.P.S.) are used in conjunction with available equipment.

2.4.2 System limitations
a. It is communication dependent
b. It is prone to congestion

3.0 FUTURE ATM/CNS SYSTEM COMPONENTS, APPLICATION, BENEFITS

3.1 General

3.3.1 Following is a review of the components and applications that will comprise the ATM/CNS system as well as benefits provided.

3.2 Communications

3.2.1 (i) Short Term

Continued use of Voice Communication VHF.
Improved AFS.

(ii) Medium Term

Continued use of Voice Communication VHF.

(iii) Long Term

Continued use of Voice Communication VHF.
Implementation of VHF Data Link.
Implementation of ATN.

3.2.2. Benefits

a. To better able to communicate flight activity and resolve conflicts/alerts.

b. The system design will ensure fault free data link communication, as well as data security.

c. To provide globa1 and data - interconnectivity.

3.3 **Navigation**

3.3.1 (i) Short Term

Continued use of NDB.

GNSS development trials and demonstrations.

(ii) Medium Term

Continued use of NDB.

GNSS development trials and demonstrations

(iii) Long Term

Withdrawal of NDB.

Progressive implementation of GNSS

Continued use of Barometric altimetry

Implementation of GNSS altitude

3.3.2 Benefits

a. GPS will enhance safety by improving the pilot's position awareness, reducing the pilot work load and enhancing navigational accuracy. It will assist greatly in reducing the potential for controlled flight into terrain, something which must be very significant in our situation.

b. Instrument approach capability will be possible.

c. Reduction in operating costs.

3.4 **Surveillance**

3.4.1 (i) Short Term

Continued use of voice reports.

(ii) Medium Term

Continued use of voice reports.

(iii) Long Term

Continued use of voice reports.

Progressive implementation of ADS

3.4.2 Benefits

Will be capable of providing surveillance and surface traffic monitoring.

.

3.5 **Air Traffic Management**

3.5.1 (i) Short Term

Windshear Detection
Evaluation of Current ATM Capacity
Dissemination of Information ATM/CNS Concepts
Instruction and Training
Dissemination of Human Aspects of ATM/CNS

(ii) Medium Term

Windshear Detection
Evaluation of Current ATM Capacity
Dissemination of Information ATM/CNS Concepts
Continued Instruction and Training
Dissemination of Human Aspects of ATM/CNS

(iii) Long Term

Windshear Detection
Evaluation of Current ATM Capacity
Dissemination of Information ATM/CNS Concepts
Continuation of Instruction and Training

3.5.2 With the implementation of this system the role of the ATS providers will shift from active traffic control to traffic management, with intervention when necessary to avoid conflicts.

4.0 **ATM/CNS TRANSITION TIMETABLE**

4.1 Guiding Principles

This plan recognises several guiding principles

a. It must be practical and progressive in its implementation.

a. Each step of the transition will necessarily undergo a trial and demonstration phase, followed by a certification/ approval process.

c. Early benefits must be achievable, measurable and in reasonable step with investment.

d. It must synchronize with the Eastern Caribbean ATM/CNS plan.

1st March, 2002

Appendix G

GRENADA ATM/CNS TRANSITION PLAN

1. INTRODUCTION

1.1 Grenada has recognised the limited scope of the existing Air Navigation/ATS Systems and has endorsed the transition towards the ICAO ATM/CNS Concept.

Grenada recognised that regional coordination and planning is necessary for the implementation of that concept and is willing to support whatever recommendations are made by IACL/DCA OECS towards that transition.

2. AREA OF RESPONSIBILITY

2.1 The scope of Grenada ATM/CNS transition plan will cover the present airspace delegated to Grenada and the proposed expansion to that Airspace.

3. CURRENT SITUATION/SHORTCOMINGS

3.1 COMMUNICATION

3.1.1 CONTROLLER- PILOT

Communication within Point Salines Airspace is achieved through the use of VHF Air to Ground Radio.

3.1.2 Limitation- system is subject to propagation problems due to surrounding terrain.

3.1.3 CONTROLLER- CONTROLLER

(a) AFTN Land Line
(b) System Limitation -Inadequate availability and reliability

3.2 NAVIGATION

3.2.1 An NDB and VDR/DME support the ATS Routes structures within the Point Salines CTR and in conjunction with PAPI support the approach to Point Salines International Airport.

3.3 SURVEILLANCE

3.3.1 Surveillance is achieved by voice position reports.

3.3.2 Limitations - Position accuracy is not optimal.

3.4 AIR TRAFFIC MANAGEMENT

3.4.1 Systems in use -ICAO standards and recommended practices (SARPS) are used in conjunction with available equipment.

3.4.2 The current Air Traffic Management suffers from dissimilar ATS procedures, language difficulties and unreliable communication facilities.

4. FUTURE ATM/CNS SYSTEMS

4.1 Grenada accepts in principle and supports the ICAO ATM/CNS concept.

4.2 COMMUNICATION

4.2.1 (i) **SHORT TERM**

- Continued use of VHF Air to Ground. Improved AFS.

(ii) **MEDIUM TERM**

- Continued use of VHF Air to Ground. (See conclusion -page 3)

(iii) **LONG TERM**

- Continued use of VHF Air to Ground.
- Implementation of VHF Data Link.
- Implementation of ATN.

4.3 NAVIGATION

4.3.1 (i) **SHORT TERM**

- Continued use of NDB, VOR/DME.
- Continued use of PAPI.
- Begin GNSS development trials and demonstrations.

(ii) **MEDIUM TERM**

- Continued use of NDB, VOR/DME.

- Continued use of PAPI.

- Development of trials of GNSS.

(iii) **LONG TERM**

- Withdrawal of NDB, VOR/DME

- Progressive implementation of GNSS

- Continued use of Barometric altimetry

- Implementation of GNSS altitude

4.4 SURVEILLANCE

4.4.1 (i) SHORT TERM

- Continued use of Voice Position reports.

(ii) **MEDIUM TERM**

- Continued use of Voice Position reports.

(iii) **LONG TERM**

- Continued use of Voice Position reports.

4 .5 AIR TRAFFIC MANAGEMENT

4.5.1 Short Term

Windshear Detection
Evaluation of Current ATM Capacity
Dissemination of Information ATM/CNS Concepts
Instruction and Training
Dissemination of Human Aspects of ATM/CNS

4.5.2 Medium Term

Windshear Detection
Evaluation of Current ATM Capacity
Dissemination of Information ATM/CNS Concepts
Continued Instruction and Training
Dissemination of Human Aspects of ATM/CNS

4.5.3 **Long Term**

Windshear Detection
Evaluation of Current ATM Capacity
Dissemination of Information ATM/CNS Concepts
Continuation of Instruction and Training
Dissemination of Human Aspects of ATM/CNS
Air/Ground Data Link Applications

Commensurate with the development in CNS and plan for progressive automation combined with improved planning will allow for more dynamic airspace and air traffic management in the Point Salines CTR.

5 CONCLUSION

There will probably be a requirement for data link in the long term. In the short and medium term the AFTN will have to be upgraded to X.25 protocol. The upgrading of the AFTN as well as the transition on ATN will depend on the plans of IACL.

20th February, 2002

Appendix H

MONTSERRAT ATM/CNS TRANSITION PLAN

1 .0 BACKGROUND

1.1 Montserrat has recognized the increasing limitation of the present Air Navigation System and the improvements needed to take Civil Aviation into the 21st Century. The limitations of the present System and problems cannot be overcome unless we embark on a new Communication Navigation and Surveillance (CNS) System to support future enhancements in Air Traffic Management (ATM). Recognizing also that implementation at the concept would require regional coordination and planning, we have therefore established a Committee to oversee all aspects pertaining to the ATM/CNS Transition.

2.0 INTRODUCTION

The Fourth GREPECAS Meeting held in Panama City (September 20-26 1994) approved the Draft CAR/SAM/ATM/CNS Transition Plan prepared by the ATM/CNS sub-group by means of conclusion 4/38, and conclusion 4/42 relating to the preparation of national plans for the transition of the new ATM/CNS System. This took into account the general guidelines established in the Draft ATM/CNS Regional Plan that was also approved and also noted that regional plans must allow for easy co-ordination within the region and with adjacent regions.

3.0 SCOPE

3.1 The scope of Montserrat's ATM/CNS Transition Plan is prepared to cover any future airspace that will be delegated to Montserrat.

4 .0 CURRENT SITUATION / SHORT COMINGS

4.1 Communication

4.1.1 Controller to pilot

A. System in use VHF

B. Short comings - blind spots due to surrounding terrain.

4.1.2 Controller to Controller

A. AFTN land line

B A5 VHF

C. Short comings - inadequate availability and reliability.

5.0 NAVIGATION

5.1 System in use - NDB could be used for enroute navigation.

A. Limitation- unable to be used as a means of separating traffic. No route structure tied into this Navigation Aid.

6.0 SURVEILLANCE

6.1 Surveillance is achieved by voice position reports.

A. Limitation- position accuracy is not optimal.

7.0 AIR TRAFFIC MANAGEMENT

A. System in use - lCAO Standards and Recommended Practices (SARPS) are used in conjunction with available equipment .

B. Short comings -No designated airspace

8.0 FUTURE CNS /ATM SYSTEMS

8.1 Montserrat accepts in principle and supports the ICAO, ATM/CNS concept.

An assessment and analysis of the characteristics and capabilities of the present system was undertaken. Arising out of that exercise, the following is proposed for its ATM/CNS Transition.

8.2 Communication

Short term

1. Continued use of VHF voice position reports.

Medium term

1. Continued use of VHF voice position reports.

2. Improve AFS

3. Progressive implementation of Aeronautical Telecommunication Network (ATN)

Long term

1. Continued use of VHF voice position reports.

2. Implementation of VHF data link.

3. Full implementation of ATN.

8.3 Navigation

Short term

1. Continued use of VHF voice position reports.

2. Continued use of PAPI's.

3. GPS trials and demonstrations.

Medium term

1. Continued use of VHF voice position reports.

2. Continued use of PAPI's.

3. Development of trials of GNSS.

Long term

1. Continued use of NDB.

2. Progression implementation of GNSS.

8.4 Surveillance

Short term

1. Continued use of voice position reports.

Medium term

1. Continued use of voice position reports.

Long term

l. Continued utilization of voice position reports.

2. Progressive implementation of ADS.

9.1 Commensurate with having designated airspace and in conjunction with the progressive implementation of the CNS System will allow for dynamic ATM in Montserrat.

7th November, 2001

Appendix I

ST. KITTS ATM/CNS TRANSITION PLAN

1.0 INTRODUCTION

1.1 St. Kitts has recognised the increasing limitations of its present Air Navigation/ATM Systems and the improvements needed to take Civil Aviation into the 21st century. The limitations of its present system are intrinsic to the system itself and the problems cannot be over unless it embarks on the concept of the new Communication, Navigation and Surveillance (CNS) Systems to support further enhancements in Air Traffic Management (ATM).

St. Kitts recognised that regional coordination and planning is required for the implementation of that concept and is willing to support recommendations made pertaining to the ATM/CNS Transition.

1.2 The scope of St. Kitts ATM/CNS Transition Plan will cover the present Airspace delegated to St. Kitts.

2.0 BACKGROUND

2.1 The Fourth GREPECAS Meeting held in Panama City (September 20-26, 1994) approved the Draft CAR/SAM Transition Plan prepared by the ATM/CNS Sub-group by means of conclusion 4/38. Conclusion 4/37 relating to the preparation of national plans for the transition to the new ATM/CNS System, taking into account me established guidelines in the CAR/SAM ATM/CNS Regional Plan. It was noted that Regional Plans must allow for easy coordination within the region and with adjacent regions.

3.0 CURRENT SITUATION/SHORTCOMINGS

3.1 COMMUNICATIONS

3.1.1 Controller - Pilot

(a) System in use: VHF Voice.
(b) System limitations: System is subject to propagation problems due to surrounding terrain.

3.1.2 Controller - Controller

(a) System in use; AFTN landline.

(b) System 1imitations: Inadequate availability and reliability.

3.2 NAVIGATION

3.2.1 System in use: An NDB and DME support the ICAO ATS route structure within the St. Kitts CTR and in conjunction with PAPI for purpose of approaches.

3.2.2 Systems limitations: Navaids range is limited due to surrounding terrain.

3.3 SURVEILLANCE

3.3.1 System in use: Voice position reports.

3.3.2 System limitations: Position report accuracy is not optimal.

3.4 AIR TRAFFIC MANAGEMENT

3.4.1 System in use: ICAO Standards and recommended practices (SARPS) are used in conjunction with available equipment-

3.4.2 System limitations:

(a) Lack of radar coverage.
(b) Airspace configuration.
(c) Dissimilar ATC procedures.
(d) Unreliable communication facilities and language difficulties.
(e) Uncoordinated provision and implementation of present CNS equipment.

4.0 FUTURE ATM/CNS SYSTEMS

4.1 St. Kitts accepts in principle and supports the ICAO CNS/ ATM concept.

4.2 COMMUNICATION

4.2.1 (i) Short Term

- Continued use of VHF air to ground.
- Improved AFS.

(ii) Medium Term

- Continued use of VHF air to ground.
- Progressive implementation of ATN.

(iii) Long Term

- Continued use of air to ground.
- Implementation of VHF Data link.
- Implementation of ATN.

4.3 NAVIGATION

4.3.1 (i) Short Term

- Continued use of NDB DME
- Implementation of PAPI
- Begin GNSS development, trials and demonstrations.

(ii) Medium Term

- Continued use of NDB DME
- Continued use of PAPI
- Development of trials of GNSS.

(iii) Long Term

- Withdrawal of NDB DME
- Progressive implementation of GNSS
- Continued use of Barometric altimetry
- Implementation of GNSS Navigation.
- Continued use of PAPI

4.4 SURVEILLANCE

4.4.1 (i) Short Term

- Continued use of voice position reports.

(ii) Medium Term

- Continued use of voice position reports.

(iii) Long Term

- Continued use of voice position reports.

4.5 AIR TRAFFIC MANGEMENT

4.5.1 **Short Term**

Instruction and Training
Dissemination of Information ATM/CNS Concepts
Dissemination of Human Aspects of ATM/CNS

4.5.2 **Medium Term**

Continued Instruction and Training
Dissemination of Information ATM/CNS Concepts
Dissemination of Human Aspects of ATM/CNS

4.5.3 **Long Term**

Continued Instruction and Training
Dissemination of Information ATM/CNS Concepts
Dissemination of Human Aspects of ATM/CNS

Commensurate with the development in CNS and plan for progressive automation will allow for more dynamic airspace and improved planning in air traffic management in the R. L. Bradshaw CTR.

20th February, 2002

Appendix J

ST. LUCIA ATM/CNS TRANSITION PLAN

1. BACKGROUND

1.1 St. Lucia has recognised the increasing limitations Of Its present Air Navigation system (ANS) and the improvements needed to take Civil Aviation into the 21st century. The limitations of its present system are intrinsic to the system itself and the problems cannot be over unless it embarks on the concepts of the new communications, Navigation and surveillance (CNS) Systems to support future enhancements to Air Traffic Management (ATM). St. Lucia is aware that implementation of the concept would require regional co-ordination and planning, and it has established a Committee to oversee all aspects pertaining to its ATM/CNS transition.

2. INTRODUCTION

2.1 The Fourth GREPECAS Meeting held In Panama City September 20-26, 1994 approved the draft CAR/SAM ATM/CNS transition plan prepared by the ATM/CNS sub-group, by means of Conclusion 4/38. Conclusion 4/42 relating to the preparation of national plans for the transition to the new ATM/CNS system, taking into account the General Guidelines established in the Draft ATM/CNS Regional Plan, was also approved, and it was noted that Regional Plans must allow for easy co-ordination within the region and with adjacent regions.

3. SCOPE

3.1 The scope of St. Lucia ATM/CNS Transition Plan includes:

1. The airspace overlying the St. Lucia CTR and the adjacent TMAS and CTR namely, the Adams TMA, the Fort-De-France TMA and the E.T. Joshua CTR, also the Piarco CTA/FIR west of the St. Lucia CTR.

4. CURRENT SITUATION SHORTCOMINGS

4.1 COMMUNICATIONS

4.1.1 Air/ground communication is effected via VHF radios.

4.2 NAVIGATION

4.2.1 VOR/DME and NDB support the ICAO ATS route structure within the St. Lucia CTR and also for purpose of approaches.

4.3 SURVEILLANCE

4.3.1 Surveillance is achieved via voice position reports.

4.4 AIR TRAFFIC MANAGEMENT

4.4.1 Air Traffic Management suffers from:

(a) Lack of Radar Coverage
(b) Airspace Configuration
(c) Dissimilar ATC procedures
(d) Unreliable communication facilities and language difficulties
(e) Uncoordinated provision and Implementation of present CNS equipment.

5. FUTURE ATM/CNS SYSTEM

5.1 St. Lucia accepts in principle the ICAO ATM/CNS concept.

5.2 In pursuance of developing St. Lucia's ATM/CNS system, a comprehensive assessment and analysis of the characteristics and capabilities of the present system was undertaken. As a result, the following is proposed for St. Lucia ATM/CNS transition.

5.3 COMMUNICATION

(a) SHORT TERM 1999-2002

Continued use of VHF voice and improved AFS for the E/CAR region.

(b) MEDIUM TERM 2003-2007

Continued use of VHF voice and progressive implementation of SSR Mode S datalink. Progressive Implementation of ATN.

(b) LONG TERM 2008-2012

Continued use of VHF voice.
Implementation of VHF datalink.
Full implementation of ATN.

5.4 NAVIGATION

(a) SHORT TERM 1998-2002

Continued utililsation of NDBs and VOR/DMES.
Continued utilisation of FMS and GPS trials and demonstrations.

(b) MEDIUM TERM 2003-2007

Continued utilisation of NDBS and VOR/DMEs.
Continued utilisation of FMS and OPS trials and demonstrations.
Progressive implementation of RNAV/RNP.
Progressive implementation of GNSS.
Continued use of Barometric Altimetry

(c) LONG TERM 2008-2012

Progressive withdrawal of NDBs and VOR DMES.
Full Implementation of RNAV/RNP.
Progressive Implementation of GNSS.
Continued utilisation of barometric altimetry.

5.5 SURVEILLANCE

(a) SHORT TERM 1998 -2002

Continued use of voice position reports.
Mandatory carriage of transponders.

(b) MEDIUM TERM 2003-2007

Continued use of voice position reports.
Progressive Implementation of SSR (Mode A/C).

(c) LONG TERM 2008-2012

Continued utilisation of voice position reports.
Full utilisatlon of SSR (Mode A/C).

5.6 AIR TRAFFIC MANAGEMENT

5.6.1 **Short Term**

Evaluation of Current ATM Capacity
Dissemination of Info ATM/CNS Concepts
Dissemination of Human Aspects of ATM/CNS
Instruction and Training of ATM/CNS

5.6.2 **Medium Term**

Evaluation of Current ATM Capacity
Continued Dissemination of Info ATM/CNS Concepts
Continued Dissemination of Human Aspects of ATM/CNS

Continued Instruction and Training of ATM/CNS
Windshear Detection

5.6.3 **Long Term**

Evaluation of Current ATM Capacity
Continued Dissemination of Info ATM/CNS Concepts
Continued Dissemination of Human Aspects of ATM/CNS
Continued Instruction and Training of ATM/CNS
Windshear Detection
Air/Ground Data Applications

Commensurate with the developments in CNS and Plan for progressive automation combined with improved planning will allow for more dynamic airspace and air traffic management in the St. Lucia CTR.

5.7 EVALUATION OF RESULTS

The following are guiding principles which the Plan must recognise.

(a) The plan must be practical and progressive in its implementation.

(b) Each step of the transition will necessarily undergo a trial and demonstration phase followed by a certification process, which produces an operational introduction phase.

(c) Early benefits must be achievable, measurable and In reasonable step with investment.

(d) Synchronisation of the airline plan with the ICAO, ATM/CNS CAR/SAM Regional implementation plan must be maintained to ensure that benefits will materialise.

(e) The real regional environment and operating realities must be recognised.

(f) Controller training must be achieved prior to implementation.

(g) Operators should provide information including pilot training activity, equipment installation status/plans, the number of GNSS routes/approaches flown, the efficiency gained vs. conventional routes/approaches, problems encountered and any suggestions for enhancements to the plan.

(h) St. Lucia CAA shall provide information including Controller training activity, impact of GNSS operations, controller workload, Air Traffic Management, and any suggestions for enhancements to the Plan.

(h) The early implementation of GNSS can bring many economic and operational benefits to St. Lucia. Operators should provide information including pilot training activity, equipment installation status/plans, the number of GNSS routes/approaches flown, the efficiency gained vs. conventional routes/approaches, problems encountered and any suggestions for enhancements to the plan.

(h) St. Lucia CAA shall provide information including Controller training activity, impact of GNSS operations, controller workload, Air Traffic Management, and any suggestions for enhancements to the Plan.

The early implementation of GNSS can bring many economic and operational benefits to St. Lucia.

20th February, 2002

Appendix K

ST. VINCENT AND THE GRENADINES ATM/CNS TRANSITON PLAN

1.0 BACKGROUND

1.1 St. Vincent and the Grenadines has recognized the increasing limitations of the present air navigation system and the improvements needed to take civil aviation into the 21st century. The limitations of the present system are intrinsic to the system itself, and the problems cannot be overcome unless we embark on a new communications, navigation and surveillance (CNS) system to support future enhancements in air traffic management (ATM). St. Vincent and the Grenadines is also cognizant that implementation of the concept would require regional coordination and planning. The ATS Committee was established to oversee all aspects pertaining to the ATM/CNS transition.

2.0 INTRODUCTION

2.1 The fourth GREPECAS Meeting, held in Panama City (1994 September 20-26) approved the DRAFT CAR/SAM ATM/CNS Transition Plan prepared by the ATM/CNS Sub-group, by means of Conclusion 4/38. Conclusion 4/42, relating to the preparation of national plans for the transition to the new CNS/ ATM system, taking into account the general guidelines established in the Draft ATM/CNS Regional Plan, was also approved. and it was noted that Regional Plans must allow for easy coordination within the Region and with adjacent Regions.

3.0 CURRENT SYSTEM LIMITATIONS

3.1 COMMUNICATIONS

3.1.1. Controller -Pilot

a) System in use: VHF

b) System limitations: VHF coverage gaps North coast St. Vincent and frequency congestion.

3.1.2 Controller -Controller

a) System in use: AFTN, land line

b) System limitations: inadequate availability and reliability.

3.2 NAVIGATION

3.2.1 System in use: NDB for en route navigation and instrument approaches.

3.2.2 System limitations

a) Inefficient route structure tied to navaid location

b)Limited range
c) Limited as a means of separating air traffic
d) Reliability and accuracy as an approach aid is questionable, especially in bad weather.

3.3 SURVEILLANCE

3.3.1 System in use: voice position reports

3.3.2 System limitations:
a) Position report accuracy is not optimal
b) Procedural separation is inefficient in a radar environment.

3.4 AIR TRAFFIC MANAGEMENT

3.4.1 System in use: ICAO Standards and Recommended Practices (SARPS) Procedural control.

3.4.2 System limitations:
a) Procedural control inefficient causing congestion in airspace
b) ATS procedures with neighbouring airspace dissimilar in cases.

4.0 FUTURE ATM/CNS SYMTEM COMPONENTS, APPLICATIONS, BENEFITS

4.1 St. Vincent and the Grenadines accepts ill principle the ICAO CNS/ ATM concept.

4.1.1 In developing the future ATM/CNS system for St. Vincent and the Grenadines. a comprehensive assessment and analysis of the characteristics and capabilities of the present system was undertaken Arising out of that exercise, the following is proposed for its CNS/ ATM transition:

4.2 COMMUNICATIONS

4.2.1.1 Short term (1997 - 2000)
a) Continued use of VHF voice
c) Improved AFS

4.2.1.2 Medium term (2001 - 2005)
a) Continued use of VHF voice
b) Progressive implementation of ATN
c) Progressive implementation of VHF Data Link

4.2.1.3 Long term (2006 -2010)
a) Continued use or VHF voice
b) Implementation or VHF data link
c) Full implementation of ATN

4.3 NAVIGATION

4.3.1.1 Short term (1997 - 2000)

(a) Continued use or NDB
(b) GPS trials
(c) Continued use of Barometric Altimetry

4.3.1.2 Medium term (2001 - 2005)

a) Continued use or NDB
b) Progressive implementation of GNSS
c) Continued use of Barometric Altimetry

4.3.1.3 Long term (2006 -2010)

a) Withdrawal or NDB
b) Implementation of GNSS
c) Continued use of Barometric Altimetry

4.4 SURVEILLANCE

4.4.1.1 Short term (1997 - 2000)
a) Continued use of voice position reports

4.4.1.2 Medium term (2001 - 2005)
a) Continued use or voice position reports
b) Mandatory carriage of transponders

4.4.1.3 Long term (2006 -2010)
a) Continued utilization or voice position reports
b) Progressive implementation of ADS

4.5 AIR TRAFFIC MANAGEMENT

4.5.1 Short Term
a) Windshear Detection
b) Evaluation of Current ATM Capacity
c) Dissemination of Information ATM/CNS Concepts
d) Instruction and Training
e) Dissemination of Human Aspects of ATM/CNS

4.5.2 Medium Term
a) Windshear Detection
b) Evaluation of Current ATM Capacity

c) Dissemination of Information ATM/CNS Concepts
d) Continued Instruction and training
e) Dissemination of Human Aspects of ATM/CNS

4.5.3 Long Term
a) Windshear Detection
b) Evaluation of Current ATM Capacity
c) Dissemination of Information ATM/CNS Concepts
d) Continuation of Instruction and Training
e) Dissemination of Human Aspects of ATM/CNS
f) Air/Ground Data Link Applications

5.0 CONCLUSION

In conjunction with the progressive implementation of CNS systems and increased automation. ATM will allow for increased airspace capacity, reduced controller workload, enhanced safety and improved detection and resolution of conflicts.

16th April, 2002

APPENDIX L

ANTIGUA AND BARBUDA - ATM/CNS TRANSITION PLAN

1.0 INTRODUCTION

1.1 Antigua and Barbuda recognizes the increasing limitations of the present air navigation system and the improvements needed to take civil aviation into the 21st century. The inherent limitations of the current system makes it necessary to transition to a new communication, navigation and surveillance (CNS) system to support future enhancements in air traffic control management (ATM) in conformity with the ICAO model and the regional plan for the E/CAR States.

2.0 BACKGROUND

2.1 The draft CAR/SAM ATM/CNS Transition Plan prepared by the ATM/CNS sub-group was approved by the fourth GREPECAS Meeting held in Panama City (1994 September 20-26). That meeting also required states to prepare national plans for the transition to a new ATM/CNS system taking into account the established guidelines in the CAR/SAM Region. It was noted that Regional Plans must allow for easy coordination with adjacent Regions.

3.0 SCOPE

3.1 The scope of the ATM/CNS Transition Plan for Antigua and Barbuda relates to the airspace under its jurisdiction, but does not include the plans for the State of St. Kitts and Nevis and the Colony of Montserrat which lie within the lateral limits of its airspace.

3.2 The terms below will have the following meanings for the purposes of this plan:

Short Term	1999 to 2003
Medium Term	2004 to 2008
Long Term	2009 to 2012 and beyond.

4.0 CURRENT SYSTEM LIMITATIONS

4.1 Communication

Air/Ground communication is effected through VHF propagation.

Controller/Controller communication is effected through the AFTN and landlines.

4.2 **Navigation**

A VOR/DME and two (2) NDBs are utilized for navigation within the Terminal Control Area.

A VOR/DME and NDBs are used for approaches at V.C. Bird International Airport.

4.3 **Surveillance**

Surveillance is achieved through Voice Position Reports.

Surveillance is also achieved through occasional SSR monitoring.

5.0 **FUTURE ATM/CNS SYSTEM**

5.1 Antigua and Barbuda recognizes that the ICAO ATM/CNS concept is being implemented globally and therefore accepts this concept.

5.2 This acceptance has therefore influenced the following plan for transition to the new ATM/CNS Plan.

5.3 **Communication**

5.3.1 **Short Term**

Continued use of VHF Communication.
Continued use of AFTN and landlines.
Implementation of improved AFS for the E/CAR.
Implementation of AIDC (to be determined)
Implementation of ATIS (to be determined)
Implementation of AMSS Data Voice (to be determined)
Implementation of VHF Data Link (to be determined)

5.3.2 **Medium Term**

Continued use of VHF Voice Communication
Continued use of AFTN and landlines
Implementation ATN
Implementation AIDC (to be determined)

5.3.3 **Long Term**

Continued use of VHF Voice Communication

Implementation of ATIS (to be determined
AMSS Data Voice (to be determined)
Implementation VHF Data Link (to be determined)
Continued use of ATN
Implementation of AIDC (to be determined)

5.4 **Navigation**

5.4.1 **Short Term**

Continued use of NDBs
Continued use of VOR/DME
Utilization of FMS/FMCS procedures

5.4.2 **Medium Term**

Continued use of NDBs
Continued use of VOR/DME
Continued utilization of FMS/FMCS procedures
Implement GNSS Navigation

5.4.3 **Long Term**

Withdrawal of NDBs
Continued use of VOR/DME
Continued utilization of FMS/FMCS procedures
Implement GNSS Navigation

5.5 **Surveillance**

5.5.1 **Short Term**

Continued utilization of Voice Position Reports
Mandatory carriage of transponders
Implementation of SSR (Mode C)

5.5.2 **Medium Term**

Continued utilization of Voice Position Reports
Mandatory carriage of transponders
Continued utilization of SSR (Mode C)
ADS (to be determined)

5.5.3 **Long Term**

Continued utilization of Voice Position Reports

Mandatory carriage of transponders
Continued utilization of SSR (Mode C)
Implementation of ADS (to be determined)

5.6 Air Traffic Management

5.6.1 Short Term

Evaluation of current ATM capacity
Dissemination of information on ATM/CNS concepts
Instruction and training on ATM/CNS
Dissemination of Human Aspects of ATM/CNS
Fixed RNAV Routes

5.6.2 Medium Term

Dissemination of information on ATM/CNS concepts
Instruction and training on ATM/CNS
Dissemination of Human Aspects of ATM/CNS
Fixed RNAV Routes

5.6.3 Long Term

Dissemination of information on ATM/CNS concepts
Instruction and training on ATM/CNS
Dissemination of Human Aspects of ATM/CNS
Fixed RNAV Routes
Application of ADS (to be determined)