ANI/WG/3 — IP/13
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Third NAM/CAR Air Navigation Implementation Working Group Meeting (ANI/WG/3)
Mexico City, Mexico, 4 to 6 April 2016

Agenda Item 4: **Follow-up, Performance Evaluation and Monitoring of the NAM/CAR Regional Performance Based Air Navigation Implementation Plan (NAM/CAR RPBANIP) Targets**
4.1 Progress Reports of the Task Forces and the ANI/WG

CARIBBEAN AIR TRAFFIC FLOW MANAGEMENT (ATFM) SURVEY RESULTS

(Presented by United States)

<table>
<tr><td colspan="2" align="center">EXECUTIVE SUMMARY</td></tr>
<tr><td colspan="2">This Paper presents the results of the Caribbean Air Traffic Flow Management (ATFM) survey that took place in 2015. The first take-away from the survey is that, as of the end of 2015, the Caribbean region has very limited ATFM/ Collaborative Decision Making (CDM) capability in place. The second point is that Caribbean States recognize the situation and supports the implementation of a regional ATFM and CDM capability.</td></tr>
<tr><td><i>Strategic Objectives:</i></td><td>• Safety
• Air Navigation Capacity and Efficiency
• Environmental Protection</td></tr>
<tr><td><i>References:</i></td><td>• Doc 9854 - <i>Global Air Traffic Management Operational Concept</i></td></tr>
</table>

1. Introduction

1.1 The purpose of this survey is to solicit information and develop a regional baseline view of current ATFM initiatives within the North American and Caribbean Regions. Additionally, information on future ATFM planning activities and interoperability between Air Navigation Providers (ANSPs) was requested.

1.2 The survey instrument is provided in **Appendix A**.

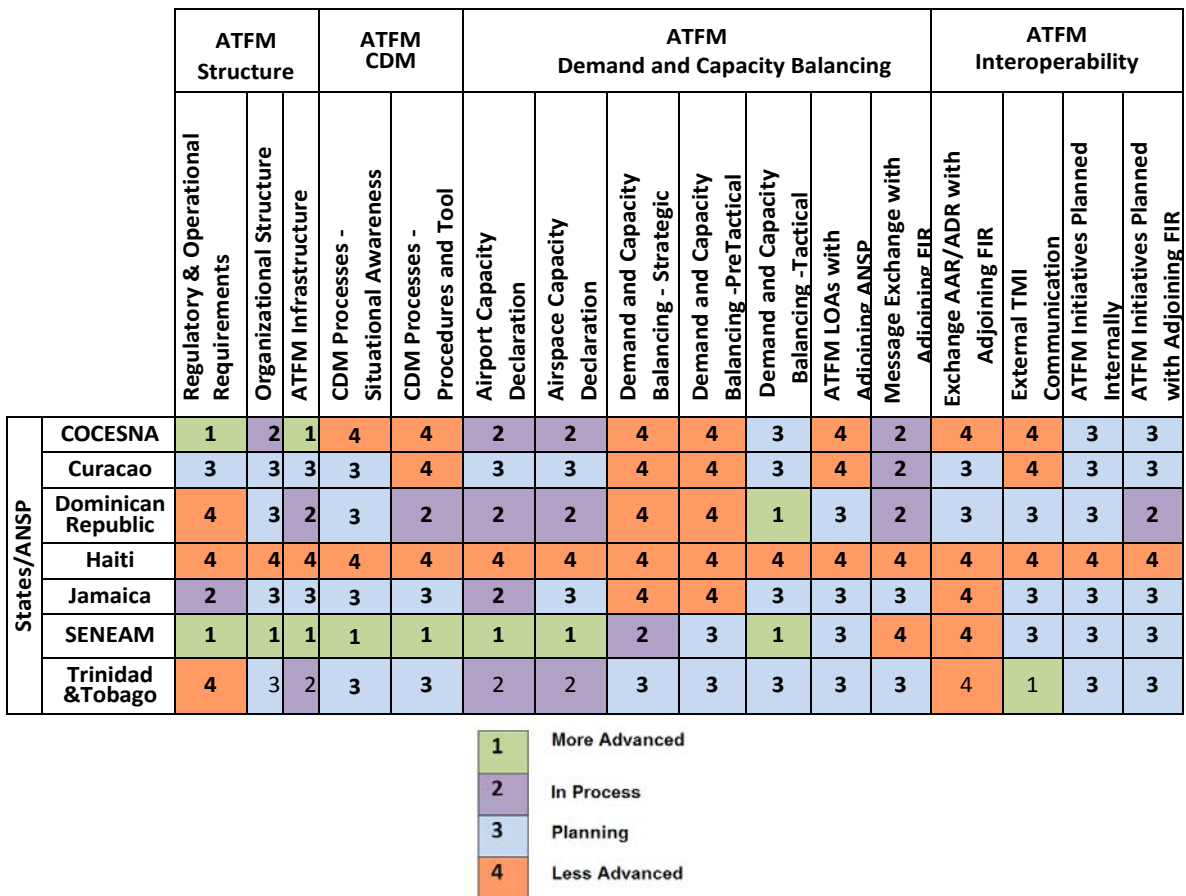1.3 Detailed survey results can be found in **Appendix B**.

2. Survey Participants

2.1 The survey was provided to eight States, of which seven responded, including:
- COCESNA
- Curaçao
- Dominican Republic
- Haiti
- Jamaica
- Mexico (SENEAM)
- Trinidad Tobago

3. Survey Results

3.1 The results of the survey are summarized in Figure 1.

States/ANSP	ATFM Structure			ATFM CDM		ATFM Demand and Capacity Balancing							ATFM Interoperability			
	Regulatory & Operational Requirements	Organizational Structure	ATFM Infrastructure	CDM Processes - Situational Awareness	CDM Processes - Procedures and Tool	Airport Capacity Declaration	Airspace Capacity Declaration	Demand and Capacity Balancing - Strategic	Demand and Capacity Balancing -PreTactical	Demand and Capacity Balancing -Tactical	ATFM LOAs with Adjoining ANSP	Message Exchange with Adjoining FIR	Exchange AAR/ADR with Adjoining FIR	External TMI Communication	ATFM Initiatives Planned Internally	ATFM Initiatives Planned with Adjoining FIR
COCESNA	1	2	1	4	4	2	2	4	4	3	4	2	4	4	3	3
Curacao	3	3	3	3	4	3	3	4	4	3	4	2	3	4	3	3
Dominican Republic	4	3	2	3	2	2	2	4	4	1	3	2	3	3	3	2
Haiti	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Jamaica	2	3	3	3	3	2	3	4	4	3	3	3	4	3	3	3
SENEAM	1	1	1	1	1	1	1	2	3	1	3	4	4	3	3	3
Trinidad &Tobago	4	3	2	3	3	2	2	3	3	3	3	3	4	1	3	3

1	More Advanced
2	In Process
3	Planning
4	Less Advanced

Figure-1. Caribbean Region ATFM Survey Summary (As of 2015)

3.2 The first take-away from the survey is that, as of the end of 2015, the Caribbean Region has very limited ATFM/CDM capability in place.

3.3   Second, it is important to note that the Caribbean States recognize and support:
- The *Port-of-Spain* Declaration, affirming their understanding of ATFM requirements and emphasizing the need for harmonization in order to achieve the objectives of the Declaration, including:
  o   Improving aviation safety efficiency and security indicators to meet the projected growth in regional air traffic
  o   Adopting a joint approach to resolving problems of common interest
  o   Collaborating to achieve joint goals
  o   Building a common understanding that delays from one State, can affect the surrounding States

3.4   The survey also pointed out that:
- The regional ATFM infrastructure is very diverse and only SENEAM and COCESNA have relatively mature, resourced ATFM operations
- The need exists to develop the human and technological infrastructure to support regional ATFM/CDM, but this is not always well understood and supported by executive management. The States do recognize, however, that management's sponsorship and support are critical elements in achieving a successful ATFM solution
- There are no reported Letters of Agreement (LOAs) related to ATFM among the States in the region. Only three States reported having CDM agreements with local stakeholders
- Many States that are encountering demand-capacity issues do not have any capability to monitor demand and capacity. Moreover, only SENEAM and COCESNA have declared the capacity values for their airports and airspace sectors
- At present, there is very limited ATFM interoperability between the States. Only three States – Curaçao, Dominican Republic and Jamaica -- reported that they have an automated data exchange capability
- Only one State, Mexico, provides standardized and recurring training for personnel that perform traffic management functions at their flow management unit.

4.   Conclusion

4.1   The Meeting is invited to support efforts that promote the regional implementation of the ATFM/CDM.

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APPENDIX A
Survey Instrument

Caribbean Air Traffic Flow Management (ATFM) Survey

The purpose of this survey is to solicit information and develop a regional baseline view of current ATFM initiatives within the North American and Caribbean Regions. Additionally, we are requesting information on future ATFM planning activity and interoperability between ANSP's.

ICAO Doc 9971, Manual on Collaborative Air Traffic Flow Management, has been used to assist in formulating the survey questions. The survey consists of the following topic areas:

- ATFM Structure and Organization
- ATFM - Capacity, Demand, Balance
- Interoperability

Please include with the survey response any pertinent documentation and/or information which may assist in the understanding and development of a baseline, planned initiatives and interoperability. Pertinent documents may include:

- Letters of Agreement
- Airport Acceptance Rate (AAR)/Airport Departure Rate (ADR) charts
- Web site(s)

Please mark an "X" to the corresponding answer. Please include comments, if you deem pertinent.

Send copies of completed survey response and electronic documents to information provided below. Clarification questions please call or email.

Mr. Lenard L. Carter
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Air Traffic Flow Management (ATFM) Structure and Organization

1 Does your administration (and/or State) have a regulatory requirement for ATFM in your Flight Information Region (FIR)?

Yes	No

Comments:

2 Does your administration (and/or State) have an operational requirement (e.g. demand exceeding capacity) for ATFM in your Flight Information Region (FIR)?

Yes	No

Comments:

3 Does your administration (and/or State) have future plans or initiatives for ATFM in your FIR? If yes, please include a copy of the Concept of Operations (ConOps) or other documentation with   the survey response.

Yes	No	No Answer/Other

Comments:

4 Does your administration (and/or State) have an organizational structure including the following facilities and/or working positions? If future organizational structure is planned, please include date.

Current	Yes	No	Planned date
1.ATFM Services			
2.ATFM Operational Manager			
3.ATFM positions located in the following			
- National ATFM center			
- Area control center(s)			
- Approach control(s)			
- Control tower(s)			

Comments:

5 If there is existing ATFM functions performed, are there dedicated resources for these ATFM functions/positions or are these functions provided by another operational position? If provided by another operational position, please identify in the comments section.

Dedicated resource	Another Operational Position

Comments:

6 Does your administration (and/or State) have Letters of Agreement (LOA) that include ATFM with any of the following stakeholders? If so, please provide a copy or relevant excerpt of the LOA(s) with the survey response:

Stakeholder	Yes	No	If yes, please list	LOA planned date
1. FIR(s)				
2. Stakeholders				
- Airport Operators				
- Aircraft Operators				
- Military				
- General Aviation				
3. ATFM Units				
- National ATFM center				
- Area control center				
- Approach control				
- Control tower				

Comments:

7 Does your administration (and/or State) have existing CDM procedures and/or tools with the following stakeholders? If future CDM procedures and/or tools are planned, please add the date.

Stakeholders	Yes	No	If yes, please list	LOA planned date
Airport Operators				
Aircraft Operators				
Military				
General Aviation				
Area control center				
Approach control				
Control tower				
Other ANSP ATFM Units				
Other ANSP ATC Units				

Comments:

8 Does your administration (and/or State) ATFM unit(s) perform the following tasks?
If future implementation planned, please add the date.

Current	Yes	No	Planned date
1. Create and distribute an ATFM daily plan			
2.Collect the following relevant information			
- meteorological conditions			
- capacity constraints			
- equipment outages			
- runway closures			
- procedural issues			
3. Analyze and distribute relevant information			
4.Coordination procedures with stakeholders			

(indicate method(e.g., voice meetings, email) and frequency) in the comments section			
5. Structured information dissemination process, i.e. website			

Comments: Note: Please include sample ATFM daily plan and/or other documentation examples with survey response.

9 Are the following CDM elements included as part of your stakeholder's participation in the ATFM process?

Current	Yes	No	If yes, please list
1.Provide updated flight plan intent information (e.g., plans, changes, delays) provided by:			
- Aircraft Operators			
- Military			
- General Aviation			
2.Telephone conferences			
- Airport			
- Military			
- Aircraft Operators			
- General Aviation			
- ATFM Units			
- Other FIR ANSP's			
3.Web based interfaces			
- Airport			
- Military			
- Aircraft Operators			

Comments:

10 Do you provide standardized and recurrent ATFM training for the following personnel and stakeholders? If standardized training is planned, please add date.

Current	Yes	No	Planned date
1.Personnel performing ATFM functions			
- National ATFM center			
- Area control center			
- Approach control			
- Control tower			
2.Stakeholders			
- Airports			
- Aircraft Operators			
- Military			
- General Aviation			

Comments:

11   Does your administration (and/or State) have an electronic ATFM system that displays airborne traffic? Is this system shared? If not, what is the planned date (if any) for sharing this system?

	Yes	No	Planned date
Electronic ATFM display system			
Shared			
1. FIR(s)			
2. Stakeholders			
- Airport Operators			
- Aircraft Operators			
- Military			
- General Aviation			

Comments:

ATFM - Capacity, Demand, Balance

12   Does your administration (and/or State) declare ATC strategic capacity values for the following resources? If capacity value declarations are planned to be completed, please add date.

Current	Yes	No	Planned date
1.Airspace sectors			
2.Waypoint(s) or boundaries			
3.Airport acceptance rate(s) (arrival and departure)			

Comments:

13   How are the declared capacity values determined? Does your administration (and/or State) have strategic airport arrival/departure slots?

Airport	Arrival	Departure

Comments:

14   Does your administration (and/or State) have a methodology to balance demand and capacity in the following time frames?

Timeframe	Yes	No
Strategic (more than 1 day before operation)		
Pre-tactical (1 day before operation)		
Tactical (day of operation)		

Comments:

15   Has your administration (and/or State) implemented procedures, review, and tools to identify available capacity, compare capacity to forecast demand and establish performance targets including: If initiatives are planned, please add date.

Current	Yes	No	Planned date
1.Airspace design review			
2.ATFM support tools			
3.Procedures review			
4.Staffing resources to workload / traffic review			
5.ATFM Training completed			
6.Forecast demand			

Comments:

Interoperability

16 Does your administration (and/or State) complete automated exchange of ATS messages (e.g., FPL, CHG, CNL, DEP, DLA, EST, ARR, CPL) with any or all adjacent Flight Information Regions (FIRs) or other non-adjacent FIRs?

FIR	Yes	No	If yes, please identify data exchanged.
TNCF			
KZMA			
TJZS			
MTEG			
Havana			
Port au Prince			
Curacao			
Barranquilla			
Panama			
Cenamer			

Comments:

17 Does your administration (and/or State) have plans to complete automated exchange of ATS messages with any or all adjacent Flight Information Regions (FIRs) or other non-adjacent FIRs?

FIR	Yes	Date	If yes, please identify data exchanged.

Comments:

18 Does your administration (and/or State) exchange Airport Acceptance Rate (AAR) information for primary airports with other FIRs? If there are plans to exchange AAR information, please provide date.

FIR	Yes	No	Planned date

Comments:

19 Does your administration (and/or State) share adjacent sector capacity information with other FIRs? If there are plans to exchange sector capacity information please provide date.

FIR	Yes	No	Planned date

Comments:

20 Does your administration (and/or State) have automated Pre-tactical (day prior to the operation) demand monitoring capability? If yes, is the information shared with other FIRs?

	Yes	No	If yes, please list FIRs
Airport Demand			
Sector Demand			
Route/Airway Demand			

Comments:

21 Does your administration (and/or State) have automated Tactical (day of the operation) demand monitoring capability? If yes, is the information shared with other FIRs?

	Yes	No	If yes, please list FIRs
Airport Demand			
Sector Demand			
Route/Airway Demand			
Timed Based Flow Management (Arrival Management)			

Comments:

22 Does your administration (and/or State) have Strategic, Pre-tactical and Tactical planning agreements with other FIRs?

Yes	No	If yes, please explain

Comments:

23 Are there plans to initiate these agreements?

Yes	No	If yes, please explain

Comments:
Note: Please include any additional documents with the survey.

24 Does your administration (and/or State) initiate the following Traffic Management Initiatives (TMIs, also known as ATFM Measures) internally?

TMIs	Yes	No	If yes, please list FIRs.
Miles-in-trail (MIT)			
Minutes-in-trail (MINIT)			
Speed restrictions			
Holding			

Fix balancing			
Altitude capping			
Alternative routing options			
Fix crossing times			
Airport arrival times			
Minimum departure intervals (MDIs)			
Slot Swapping			
Published, pre-defined alternative routes			
Ground delay program (GDP)			
Ground stop (GS)			

Comments:

25 When determining a TMI, are the following factors considered?

	Yes	No
Demand exceeds capacity		
Weather		
Military exercises		
Resources		
Maintenance / outages		
VIP movements		

Comments:

26 Does military airspace/activity cause the use of TMI's? If yes, please explain.

27 Is the military airspace/activity included in strategic planning?

28 How is the effectiveness of the TMI analyzed?

29 What are the primary demand- capacity imbalance reasons for the TMI's?

	Please list airport/sector/route/airway
Airport capacity	
Sector capacity	
Route/Airway capacity	
Other	

Comments:

30 Does your administration (and/or State) initiate the following Traffic Management Initiatives (TMIs) to adjacent FIRs?

TMIs	Yes	No	If yes, please list FIRs.
Miles-in-trail (MIT)			
Minutes-in-trail (MINIT)			
Speed restrictions			

Holding			
Fix balancing			
Altitude capping			
Alternative routing options			
Fix crossing times			
Airport arrival times			
Minimum departure intervals (MDIs)			
Slot Swapping			
Published, pre-defined alternative routes			
Ground delay program (GDP)			
Ground stop (GS)			

Comments:

31 How is the appropriate TMI determined?

32 What are the primary demand- capacity imbalance reasons for the TMI's?

	Please list airport/sector/route/airway
Airport capacity	
Sector capacity	
Route/Airway capacity	
Other	

Comments:

33 Does your administration (and/or State) initiate the following Traffic Management Initiatives (TMIs) to adjacent FIRs?

TMIs	Yes	No	If yes, please list FIRs.
Miles-in-trail (MIT)			
Minutes-in-trail (MINIT)			
Speed restrictions			
Holding			
Fix balancing			
Altitude capping			
Alternative routing options			
Fix crossing times			
Airport arrival times			
Minimum departure intervals (MDIs)			
Slot Swapping			
Published, pre-defined alternative routes			
Ground delay program (GDP)			
Ground stop (GS)			

Comments:

34 How is the appropriate TMI determined?

35 Does your administration (and/or State) communicate Traffic Management Initiatives through automated or verbal communication with adjacent FIRs?

	Automated	Verbal	Please list FIRs
Miles in trail			
Speed restrictions			
Holding			
Altitude			
Fix crossing times			
Airport arrival times			
Ground delay programs			
Ground stops			

Comment:

36 If your administrations (and/or State) have future ATFM initiatives planned **with other FIRs** please list them below:

Initiative Title	
Primary Functions	
Status (Planning, Approved, Implementation, Testing)	
Initial Operational Capability Date	
Full Operational capability Date	

Comments:

Note: Please include any related documents with the survey.

37 If your administration (and/or State) has future ATFM initiatives planned please list them below.

Initiative Title	
Primary Functions	
Status (Planning, Approved, Implementation, Testing)	
Initial Operational Capability Date	
Full Operational capability Date	

Comments:

Note: Please include any pertinent documents

38 ICAO has identified various ATFM and CDM initiatives in the Aviation System Block Upgrades (ASBU) process (Block 0 and Block 1 to be implemented by 2018). Please identify which of the following have been implemented or are planned to be implemented:

ASBU initiatives	Implemented	Planned
B0-80 Improved Airport Operations through A-CDM		
B0-15 Improved Traffic Flow through Runway Metering		

B0-25 Increased Interoperability, Efficiency and Capacity through Ground-Ground Integration		
B0-30 Service Improvement through Digital Aeronautical Information Management		
B0-10 Improved Operations through Enhanced En-Route Trajectories		
B0-35 Improved Flow Performance through Planning based on a Network-Wide view		
B1-80 Optimized Airport to Airport Operations through A-CDM		
B1-15 Improved Approach and Departure Management through Integration		
B1-25 Increased Interoperability, Efficiency and Capacity through FF-ICE/1 application before Departure		
B1-30 Service Improvement through Integration of all Digital ATM Information		
B1-31 Performance Improvement through the application of System Wide Information Management (SWIM)		
B1-35 Enhanced Flow Performance through Network Operational Planning		
B1-105 Better Operational Decisions through Integrated Weather Information (Strategic >40 Minutes)		
B1-40 Improved Traffic Synchronization and Initial Trajectory-Based Operation		

Comments:

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APPENDIX B
DETAILED SURVEY RESULTS

Appendix B analyzes the ATFM capability of the States and Interoperability of ATFM between the States in the region. This Appendix is based on the Survey Questionnaire from Appendix A.

1. ATFM Structure

Dedicated resources define the commitment to ATFM and the ability to complete the initiatives. The level of resources identified should be scalable to the needs of individual States.

The main criteria in determining an ATFM structure were an ANSP's human resources commitment, personnel, dedicated positions, and equipment available to perform ATFM and the existence of internal and external stakeholder ATFM Letters of Agreement (LOAs). The survey questionnaire was designed to gain an understanding of the organizational structures in place to support implementation of ATFM throughout the NAM/CAR Region. Questions were posed to determine the ATFM capability of States to migrate to an ATFM solution in the near term.

1.1 Regulatory Requirements

ATFM Regulatory Requirements describe the goal an organization aspires to achieve. To effectively implement ATFM, a State will need regulatory requirements to ensure that ATFM implementation follows those requirements.

Three of eight respondents indicated that they do have a regulatory requirement for ATFM in their FIR. One State reported that all of the air traffic coming into their airport must request an expected time of departure (ETD) clearance from their flow management unit. Several States are in the process of implementing various components of AFTM; e.g., ATFM Concept of Operations (CONOPS), an ATFM operator user manual along with LOAs and Memorandums of Understanding (MOUs). Other States are still in the planning stage. The States that do not have regulatory requirements are encouraged to use ICAO Doc 9971 as the basis for their regulatory framework. States are also encouraged to seek counsel from States in the region who have mature regulatory requirements.

1.2 ATFM Organizational Structure

ATFM Organizational Structure defines how positions, activities, task allocation, coordination, and supervision are established to achieve the ATFM efficiency goals.

From Q4: Three States indicated that they have ATFM services in place and two others stated that they have them planned for 2015. These same States have ATFM operational managers in place or plan to put one in place in the next year. Only one State has a staffed ATFM unit and two States have plans for them in the next year. Two States have staffed Area and Approach control facilities in place and two other States plan to have them in place in the next year. One State has an ATFM-staffed control tower and two other States plan to have them in place in the next year.

1.3 ATFM Infrastructure

ATFM Infrastructure refers to the collective body of dedicated human resources, positions, equipment available to perform ATFM, and internal and external stakeholder ATFM LOAs. These dedicated resources define the State's commitment to ATFM and the ability to complete the initiatives. The level of resources identified should be scalable to the needs of individual States.

Three States indicated that they have dedicated resources to AFTM functions and two others stated that the air traffic control (ATC) supervisor is their dedicated resource to ATFM. There is one State with a mature ATFM structure and four States with developing ATFM structures. None of the respondents indicated that they have LOAs that include ATFM with stakeholders but three stated that they have plans to implement LOAs in 2015 that include ATFM with various stakeholders (e.g., airport operators, area control centers, etc.). One State reported that in 2015 it plans to: establish an ATFM Unit to analyze daily the flow of air traffic and any constraints to capacity (e.g., weather, unscheduled CNS outages, etc.) to assist the ATC unit to manage the traffic; disseminate airspace status to adjacent FIRs and coordinate any ATFM measures that may have to be implemented, and; participate in daily/weekly ATFM telephone conferences (telecons).

2.   **CDM Infrastructure and Process**

CDM is defined as a process focused on how to decide on a course of action articulated between two or more community members. Through this process, ATM community members share information related to that decision and agree on and apply the decision making approach and principles. The overall objective of the process is to improve the performance of the ATM system as a whole while balancing the needs of individual ATM community members (ICAO Doc 9971, Manual on Collaborative Air Traffic Flow Management).

There were several questions in the survey to ascertain States' use of CDM processes, procedures and tools. CDM is evolving in several Caribbean States. For the most part the emphasis is on domestic procedures and/or tools. Four States indicated that they will be developing CDM procedures and/or tools with various stakeholders over the next two years. Two States receive updated flight plan intent information (e.g., flight plans, changes, delays) from aircraft operators and general aviation stakeholders and participate in telecons with various stakeholders (e.g., ATFM units, airports, etc.). One State indicated that it receives flight intent data via AFTN. While several States indicated that they have no stakeholder participation in their ATFM processes, one State indicated that it has plans to initiate CDM participation in their ATFM process with stakeholders in 2016 via telecons and web-based interfaces.

For ATFM to be successful, CDM among the Caribbean States is essential and a strategy of collaboration must be promoted in a region-wide communication plan or other document (e.g., Caribbean region CDM Memorandum of Agreement).

ATFM Training

ATFM training is foundational to the development of a regional ATFM solution. Understanding ATFM roles and responsibilities, traffic management initiatives, and operational practices among stakeholders enhances system performance through better decision making.

Dominican Republic, Trinidad and Tobago, and Curacao plan on offering standardized and recurrent ATFM training in 2016. Trinidad and Tobago will use a phased approach starting with supervisors and ATC staff during the initial stage of ATFM implementation, and provide training on the strategic and pre-tactical planning process for ATFM during the later stages of implementation. The other respondents do not currently offer recurrent training.

3.   **ATFM Demand and Capacity Balancing**

**Airspace and Airport Capacity Balancing**
Defining airport and airspace capacity are foundational to both a domestic ATFM system and an interoperable cross-FIR system. In managing ATM system constraints, accurate airport and airspace capacity declarations provide targets for the development of collaborative planning. Managing to these targets helps to enhance the safety and efficiency of the airspace system.

(Q2) Four States (Jamaica, Trinidad and Tobago, SENEAM, Curacao) have an operational requirement (i. e., when demand exceeds capacity) to apply ATFM measures in their FIRs. (Q12) One State (Mexico) declares ATC strategic capacity values for airspace sectors. None of the respondents declare ATC strategic capacity values for waypoints or boundaries and only one State declares airport acceptance rates (arrival and departure). Three States (Dominican Republic, Trinidad and Tobago, and Curacao) plan to declare ATC strategic capacity values for airspace sectors, waypoints or boundaries and their airport acceptance rates in 2016.

None of the States surveyed stated that they have strategic airport arrival/departure slots. (Q14) One State (Trinidad and Tobago) indicated that it has a methodology to balance demand and capacity strategically (more than 1 day before operation) and pre-tactical (1 day before operation). Three States (Dominican Republic, Trinidad and Tobago, and Mexico) said they have a methodology to balance demand and capacity tactically (day of operation). (Q15) Two States (Trinidad and Tobago, Mexico) have implemented procedures, reviews, and tools to identify available capacity, compare capacity to forecast demand and establish performance targets for airspace design. One State (Trinidad and Tobago) has implemented procedures, reviews, and tools to identify available capacity, compare capacity to forecast demand and establish performance targets for staffing resources for workload/traffic review. One State (Mexico) has implemented procedures, reviews, etc., for ATFM support tools, procedures review, ATFM training and has the ability to forecast demand. Three States (Dominican Republic, Trinidad and Tobago, and Curacao) have planned for initiatives in 2016 to identify available capacity, compare capacity to forecast demand and establish performance targets. (Q32) Two States (Dominican Republic, Mexico) reported that significant airport demand-capacity imbalance was a major reason for traffic management initiatives (TMIs). Two States (Dominican Republic, Mexico) indicated that sector demand-capacity imbalance was another reason for TMIs. None of the respondents reported route/airway capacity as sources of demand-capacity imbalance that required TMIs.

Strategic, Pre-tactical, Tactical DCB

The distinct phases of the ATFM DCB planning and execution cycle organize the planning process into a cycle of continual improvement (see Figure B-1). An efficient regional ATFM solution will necessitate stakeholder involvement, a systemic approach, and accurate DCB activities.
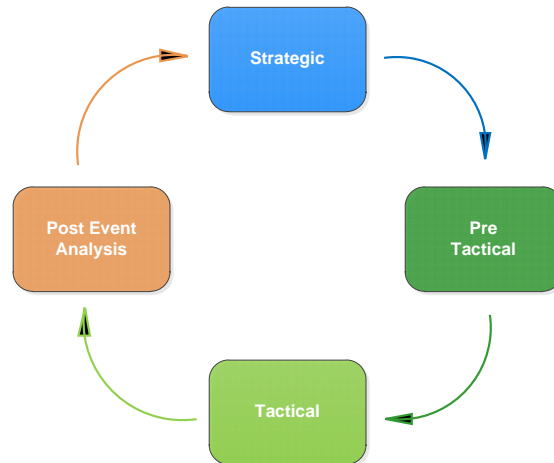
Figure B-1: ATFM DCB Planning and Execution Cycle

Strategic

Strategic ATFM involves analyzing and planning for DCB more than one day before operations. The Strategic element provides advanced planning based on anticipated and known constraints and incorporates this knowledge into the continuous planning cycle.

One State (Mexico) reported that they include military operations in strategic planning. In general, however, there is very little strategic ATFM being undertaken in the region and no formal cross-FIR strategic ATFM is in place.

Pre-tactical

Pre-Tactical ATFM involves analyzing and planning for DCB one day before operations. The pre-tactical element provides prior-day planning adjustments based on the identification and anticipation of known events that may impact ATFM.

No States reported that they have the capability to perform automated pre-tactical ATFM demand monitoring. Lack of this capability prevents States in the region from carrying out any meaningful pre-tactical ATFM. States need to establish procedures and decision support capabilities to enable this element of AFTM. Two States plan to initiate pre-tactical ATFM planning in 2016.

Tactical

Tactical ATFM involves real-time analysis and planning for DCB and takes into account day-of-operational constraints that may require implementing ATFM measures.

Two States perform Tactical ATFM while five other States are planning to make more effective use of Tactical planning. One State (Mexico) reported having automated Tactical demand monitoring capability. None of the States indicated that they share tactical demand monitoring with other FIRs.

States Implementing Specific ATFM Initiatives

States implementing appropriate ATFM initiative(s) to maximize utilization of available capacity through the stages of DCB help define the goals of ATFM. Domestic and cross- FIR ATFM initiatives are components of a regional solution.

(Q22) None of the respondents reported having Strategic, Pre-tactical and Tactical planning agreements with other FIRs. (Q23) Three States (Dominican Republic, Trinidad and Tobago, Curaçao) have plans to initiate these agreements. Two States (Trinidad and Tobago, Curaçao) noted that it would be part of their ATFM implementation planning in 2016. (Q24) As many as six States initiate a variety of TMIs internally. (Q25) Several State respondents said that they consider demand-capacity imbalances, weather, and maintenance outages when determining a TMI. Two States (Trinidad and Tobago, Mexico) also consider Very Important Person (VIP) movements. (Q26) None of the States reported that military airspace/activity causes the use of TMIs. (Q28) Four States (Dominican Republic, Trinidad and Tobago, Mexico, Curaçao) reported that effectiveness of a TMI is analyzed qualitatively at the "reacting/daily" level and on the basis of the results.

(Q29) The primary demand-capacity imbalance reasons for the TMIs reported by as many as four Caribbean States include: Sector capacity (Dominican Republic, Trinidad and Tobago, Mexico, Curaçao). Dominican Republic noted ACC North Sector. Ramp congestion (Trinidad and Tobago). They noted TAPA, TVSV, TVSC ramp congestion.

Route/airway capacity (Dominican Republic, Jamaica, Trinidad and Tobago, Curaçao). Jamaica noted UL780, UG437 and UL465 into Panama, and UG430, UL417 and UA301 into Barranquilla. Trinidad and Tobago noted North Sector seasonal heavy flow from TJXS to KZNY FIR that exceeds capacity of the sector, and heavy seasonal departure flows from various airports within the TTZP FIR. Curaçao noted UL795, UA315, UA319 and UA567.

FIR boundary point excess demand. Jamaica noted UL795, UG442, UL674 into Curaçao. Haiti noted demand-capacity imbalances over FIR boundary points as reasons for TMIs.

Tools and Procedure Review

Common situational awareness of air traffic demand, knowledge of airport and airspace capacity, application of meteorological information, and the ability to share information are components of a mature ATFM system.

4.   Interoperability

ATFM interoperability amongst States is very complex but essential in delivering efficient operations. To achieve an effective, efficient ATFM system in the Caribbean region, an interoperable network approach is warranted. A major focus of the study is to identify the interoperability between States with regard to ATFM. Our analysis has shown there is no substantial interoperability currently in place but are planned in the near future.

4.1   ATFM Measures Communicated in External LOA

Operational information exchange of ATFM measures is foundational for ATFM. LOAs provide the ability to improve preplanning, reduce tactical coordination, and standardize actions and initiatives. To enable the

processes associated with implementing ATFM measures across FIRs, LOAs will need to be developed or updated. (Q6) None of the respondents indicated that they have LOAs that include ATFM with stakeholders but three stated indicated that they have plans to implement LOAs with various stakeholders in 2016. Curaçao indicated that they plan to do the same in 2017.

4.2   Air Traffic Service (ATS) Message Exchange with Adjoining FIRs

ATS detailed databases of fundamental routes, route systems, navigational aids (NAVAIDs), airports, airspace status, sectors, and arrival and departure procedures are necessary to support ATFM interoperability. Regional ATFM initiatives will require, at a minimum, ATS message exchange. The survey results indicate that this basic requirement is being met.

(Q16) Three States (Dominican Republic, Jamaica, Curaçao) indicated that they have automated exchange of ATS messages with adjacent FIRs. (e.g., Dominican Republic with FPL, CHG, CNL, DEP, DLA, EST, ARR, CPL; Jamaica with FPL; and Curaçao with FPL, CHG, CNL, DEP, DLA, EST). The Dominican Republic noted that in 2016, they will have the ability to exchange ATS messages with adjacent States based on information exchange procedures listed in LOAs. COCESNA indicated that they have an automated exchange of ATS messages with airports in Central America. And yet another State (Mexico?) noted that they have the ability but there are some technical issues that are being worked out and they have not initiated a discussion with the adjacent FIRs on this initiative.

(Q17) The Dominican Republic plans to complete the automated exchange of ATS messages with Miami Oceanic (KZMA), San Juan (TJZS) and Curaçao (TNCF) in 2016. Haiti plans to complete the automated exchange of ATS messages with KZMA, Dominican Republic (MDCS), TNCF, Jamaica (MKJK), and Havana (MUFU) in 2017. Trinidad and Tobago plans to complete the automated exchange of ATS messages (CPL, ACP, CHG, EST, CDN, LAM, and LRM) with New York Oceanic (KZNY), Santa Maria Portugal (LPPO) and French Guyana (SOCA) in 2016.   Additional comments were provided by several States: Jamaica automated exchange is to be determined; and, Trinidad Tobago indicated that automated data exchange is not based on a formal agreement with any of their adjacent FIRs and that they still have to engage in discussion with each of them on exactly what data will be exchanged in 2016.

4.3   Sharing Airport Acceptance Rate (AAR)/Airport Departure Rate (ADR)

The stakeholder decision making process associated with DCB for an airport is dependent upon accurate AAR/ADRs. Advanced coordination with stakeholders and implementation of appropriate ATFM measures based upon AAR/ADR as demand exceeds capacity results in efficient ATFM processes. (Q18) Trinidad Tobago and Dominican Republic plan to share AAR/ADR information with adjacent FIRs in 2016.

4.4   Sharing Adjacent Sector Capacity

Monitoring demand takes place in all phases of the Strategic, Pre-Tactical, Tactical DCB cycle. When demand exceeds or is expected to exceed capacity of an airport, route, or airspace, ATFM actions may be warranted. (Q19) No States reported that they share adjacent sector capacity information with other FIRs. However, the Dominican Republic and Trinidad and Tobago plan to share adjacent sector capacity information in 2016 with other FIRs. SENEAM and Curaçao also plan to do so but they did not specify a time frame in their response.

4.4   ATFM Initiatives Planned with Adjoining FIRs

Coordinated ATFM initiatives between States are often needed because of the widespread effects of operational constraints on the flow of air traffic. Constraint management can be best achieved through the CDM process. A regional approach will be driven by stakeholder engagement and operational needs between States.

(Q30) Six States (Dominican Republic, Jamaica, Trinidad and Tobago, Mexico, Haiti, and Curaçao) indicated that they have initiated a variety of TMIs (e.g., Miles-in-Trail (MIT), Minutes-in-trail (MINIT), Alternative routing options, etc.) to adjacent FIRs such as Panama, Curaçao , Barranquilla ACCs, TJZS, KZNY, SYGC, MDCS, TNCF, KZMA, and MKJK. (Q31) Reasons cited for implementing TMIs are: criteria applied by the operational supervisor; traffic density and traffic distribution throughout the sector, and; traffic demand. (Q36) Trinidad and Tobago reported future ATFM initiatives planned with other FIRs (e.g., standardize the implementation of ATFM measures such as TMIs between FIRS; and, create formalized ATFM LOAs with KZNY. (Q37) Trinidad and Tobago reported that in 2016 they plan to establish an ATFM Unit to: analyze daily the flow of air traffic and any constraints to capacity (e.g., weather, unscheduled CNS outages); assist the ATS unit to manage the traffic; disseminate airspace status to adjacent FIRs; coordinate any ATFM measures that may have to be implemented; and, participate in daily/weekly ATFM telecons.

5.   Survey Recommendations

The recommendations described in this section are first intended to ensure that the momentum of current Regional ATFM initiatives is maintained. Based on the results of the ICAO surveys, analysis of current plans, and an assessment of progress on ATFM initiatives in the region, the proposal team makes the following recommendations:

Recommendation 1: Develop the Caribbean Regional ATFM Concept of Operations

The Caribbean Regional ATFM Concept of Operations should be developed by the stakeholders to provide a harmonized, cross-border approach to ATFM in the region. Key aspects of the concept should include:

- The sharing of information.

- Harmonized, interoperable procedures.

- Collaborative processes and tools to manage traffic flows throughout the Caribbean airspace.

Under the concept, States will maintain responsibility for traffic flow management within their own FIRs. State-managed ATFM systems should have the ability to directly link to the regional network/system. Existing and planned ATFM implementations will take the form of bilateral and multi-FIR processes.

Airline and airport operators are both key stakeholders in the concept development and need to be fully engaged from the outset—as they have been in current initiatives. Stakeholder acceptance of the concept is crucial to successful implementation of regional ATFM.

ICAO ATFM Steering Group support and communication of the Caribbean regional ATFM Concept of Operations will reinforce stakeholder acceptance and provide a mechanism for constructive feedback to allow evolution of the concept without divergence, dilution of focus, or delays in implementation that may result from exploring alternative or competing concepts for the region.

Recommendation 2: State Commitment to the Caribbean Regional ATFM Operational Trial

While there are substantial and critical individual State ATFM initiatives underway, a successful Caribbean regional ATFM Operational Trial in 2017 and subsequent follow- on Operational Trial phases are considered to be very critical factors to regional acceptance and implementation. ANSPs, Airport Operators, and Airline Operators each play a critical role in the execution of the operational concept and, likewise, yield the greatest operational benefits from its implementation. Undoubtedly there will be challenges encountered during the course of preparation and execution of the Operational Trial. Member States and Organizations of CANSO play an important role in ensuring that all stakeholders understand the objectives of the Operational Trial, are adequately prepared to support the effort, and remain constructive contributors to advancing the concept toward implementation.

Recommendation 3: Secure Budgetary Commitments

In order to achieve the Caribbean Regional ATFM solution and implementation timelines, it is critical that States allocate the necessary budget and planning resources. Even for mature ATM organizations, the survey responses in the region suggest that ATFM implementations, while recognized as a critical need, are often planned and allocated budget/resources along with -- or after -- much larger ATM investment requirements with longer implementation cycles. ATFM implementations typically require an order of magnitude less resources than other ATM automation improvements. Regional ATFM deployment cycles can be as short as six to nine months. Since the benefits achieved through ATFM are substantial, gaining budgetary and planning commitments from State senior officials in the 2016 time frame is essential to achieving a Caribbean Regional ATFM implementation in the 2018 time frame.

Recommendation 4: Increase Capacity and Optimize Airspace and Airport resources

In concert with securing commitment for the Caribbean Regional ATFM implementation, commitment must be maintained by ANSPs and Airport Operators to increase capacity and optimize constrained resources. Regional ATFM alone will not create additional capacity to meet the growing demand on the airport and airspace resources in the Caribbean region. The Regional ATFM implementation is, however, essential for effectively managing demand and capacity imbalances while long-term capacity improvements are implemented.

Recommendation 5: Commitment to Timelines Set for Caribbean Regional ATFM Implementation

ICAO plays an important role in fostering commitment by all ATM stakeholders to the ASBU timelines. ICAO, through the Caribbean ATFM Steering Group, should maintain engagement and continue to exercise its leadership role on the key initiatives leading to implementation of Regional ATFM.

Specifically, ICAO should continue its leadership role with the following:

- Continue the ICAO Caribbean ATFM Steering Group until implementation of cross-border Regional

ATFM in Caribbean.
- Completion of the ICAO ATFM Framework Document in time to aid implementation of the Regional ATFM concept.
- Ensure convergence toward the Caribbean Regional ATFM Concept of Operations among the ICAO Sub-regional coordination groups with ATFM agenda elements.
- Continue to educate (Via ATFM workshops) and assist States with ATFM implementation.

Recommendation 6: Educate Airlines on Benefits of ATFM and Assist With Education of Operational Airline Staff on ATFM

As a leading voice for the Airline Operators, IATA plays an important role in communicating the benefits case of ATFM to its primary beneficiaries. In addition, IATA can effectively support its constituents in effectively organizing and mobilizing airline operations staff to take full advantage of ATFM through active operator participation. Early and effective engagement of the region's Airline Operators during the Caribbean ATFM operational trial would support an acceleration of adoption by the stakeholder community and provide a multiplier effect in the influence on other stakeholders to maintain commitments for the Caribbean Regional ATFM implementation.

Recommendation 7: Inform All Stakeholders of the Benefit and Requirement of ATFM

Successful implementation of ATFM in other States has been led by strong leadership in all stakeholder groups; a communication strategy informing leadership of the requirements and benefits of Regional ATFM implementation should be followed. ICAO, IATA, and CANSO can all assist by sponsoring ATFM workshops in the region.

These workshops should draw upon the expertise of ATFM practitioners from around the globe. These workshops should be coordinated with the CRCSG in order to project a common and consistent set of themes and messages to all stakeholders.

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