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RTCA Paper No. 288-15/TOC-23

July 21, 2015

Meeting Summary, July 21, 2015

Tactical Operations Committee (TOC)

The tenth meeting of the Tactical Operations Committee (TOC), held on July 21, 2015, convened at 9:00 a.m. The meeting discussions are summarized below. The following attachments are referenced:

Attachment 1 – List of Attendees
Attachment 2 – Presentations for the Committee (containing detailed content of the meeting)
Attachment 3 – Summary of the May 20, 2015 TOC Meeting
Attachment 4 – Air Traffic Organization Positions Chart
Attachment 5 – Review of NOTAM Search Phase 2 Implementation
Attachment 6 – Recommendations to Improve Operations in the Caribbean
Attachment 7 – GPS Adjacent Band Compatibility Feedback on Exclusion Zones
Attachment 8 – Class B Airspace Designation, Design and Evaluation

Welcome and Introductions

Committee Co-Chair, Mr. Jim Bowman, Vice President of Flight Operations at FedEx Express called the meeting to order and welcomed the TOC members and others in attendance. Co-Chair, Mr. Dale Wright, National Air Traffic Controllers Association (NATCA), was unable to attend due to a personal matter. All TOC members and attendees from the public were asked to introduce themselves (TOC members and General Public Attendees are identified in Attachment 1).

Mr. Bowman reviewed the agenda and began the proceedings of the meeting.

Designated Federal Official Statement

Ms. Elizabeth "Lynn" Ray, Vice President of Mission Support for the Air Traffic Organization (ATO), and the Designated Federal Official of the TOC, read the Federal Advisory Committee Act notice governing the open meeting.

Approval of May 20, 2015 Meeting Summary

The Chair asked for and received approval of the written Summary for the May 20, 2015 meeting (Attachment 3).

FAA Report

Ms. Ray next provided a report from the FAA on various topics relevant to industry. She informed the TOC that discussions around reauthorization were anticipated to begin in September 2015. Key issues for the Administrator include stabilizing funding for core air traffic and modernization efforts like NextGen and facility modernization. She noted that both bills in the House and Senate called for FAA funding at the President's level of request but that this was unlikely to be in place by October 1, 2015. Ms. Ray commented that the FAA is planning for a Continuing Resolution into the next fiscal year, anticipating funding at current levels which are $108 million less than requested.

Ms. Ray informed the TOC that a key focus area for the FAA is hiring, and controllers and Technical Operations are at the forefront of priorities. She also stated that for Unmanned Aerial Systems (UAS), a separate directorate would be established and would be an integration office with an executive. A Chief of Staff in this directorate would report to the Deputy Administrator on UAS.

Ms. Ray then spoke to the TOC about a series of Organizational Changes within the Agency (see Attachment 4). She noted that Mr. Randy Park had been made permanent Deputy COO, Mr. Joseph Texeira had announced his retirement, Ms. Nancy Kalinowski had assumed the role of Deputy Vice President of Management Services and that Mr. Jim Eck had become Vice President of Program Management. A TOC member inquired whether the amount of turnover in the executive ranks was a normal rate of turnover or whether it was more than typical. Ms. Ray noted that there was an increase in turnover given that the current executives included a prevalence of individuals that were at or near retirement. She also stated that this trend was not expected to change in the near future. Another TOC member asked whether the FAA would fill open executive roles internally or whether the FAA would consider candidates outside of the FAA. Ms. Ray answered that such positions were generally bid and filled internally within the FAA.

NOTAM Task Group Recommendation on NOTAM Search Phase 2 Implementation

Mr. Mark Cardwell, FedEx Express, and Chair of the NOTAM Task Group next briefed the TOC on the next set of recommendations on NOTAM Search. He informed the TOC that the NOTAM Task Group had reviewed Phase 2 deployment of FAA's NOTAM Search. Mr. Cardwell noted that the group only had four recommendations to offer – primarily focused on improving training and help information associated with the NOTAM Search website. He stated that the group's input was trending to a reduced number of recommendations. He commented this was a reflection of the FAA's efforts to work diligently and effectively in its implementation of NOTAM Search.

One TOC member asked how the Task Group's feedback was generated. Mr. Cardwell informed the TOC that it was generated from Task Group members, from membership organization members as well as input the FAA receives on its NOTAM Search website.

Another TOC member inquired about more information on Phase 4 of NOTAM Search. The TOC was informed by the FAA that in Phase 4 deployment, any remaining functionality from PilotWeb not in NOTAM Search would be implemented in NOTAM Search. PilotWeb would then be sunset within the following year.

Committee Action: The Committee agreed by consensus to approve the NOTAM Recommendations on NOTAM Search Phase 2 Implementation (Attachment 5).

Eastern Regional Task Group: Recommendations to Improve Operations in the Caribbean

Mr. Joe Bertapelle, JetBlue, next briefed the TOC on a series of recommendations from the Eastern Regional Task Group (ERTG) pertaining to improving operations in the Caribbean. Mr. Bertapelle Co-Chaired the ERTG effort with Mr. Glenn Morse, United Airlines, who was unable to attend the meeting.

Mr. Bertapelle informed the TOC that the ERTG's effort in the Caribbean had brought together a wide array of stakeholders from industry (ALPA, DoD, IATA, air carriers, NATCA, NBAA) and the FAA (International office, Eastern Service Center PRG and OSG, Management and NATCA personnel from ZNY, ZMA and ZSU, MTO for Southeast, Oceanic and Offshore Procedures group, Office of International Affairs and SBS Office).

Mr. Bertapelle then gave the TOC some background on what issues were driving operational challenges in the Caribbean. He spoke about the growth the region had experienced and that which was projected into the future. He described how this growing set of operations in the Caribbean go through a funneling effect in which traffic narrows into a corridor between Miami and San Juan. He also described various infrastructure issues with communications and surveillance, that the airspace was not aligned to the traffic and various challenges coordinating with other foreign air navigation service providers (ANSPs) in the region. (Note that Mr. Bertapelle's briefing materials may be found in Attachment 2.)

Finally, Mr. Bertapelle presented a series of recommendations that organized into infrastructure priorities, airspace priorities and harmonization:

Category		**Prioritized Recommendations**
Infrastructure Priorities	Communications	Implement a New Communications Frequency at Saint Maarten
		Implement a New Communications Frequency at Abaco Island
		Install Dedicated Shout Lines with Certain Adjacent or Underlying International Facilities
	Automation	Regional Implementation of Automation:

		1. Continue implementation of ADE with Santo Domingo 2. Develop software translation for neighboring facilities with AIDC protocol 3. Ensure ERAM software upgrades associated with ADE stay on schedule
		Implement Independent Flight Data Processing in ZSU
	Surveillance	Implement ADS-B in the Caribbean
		Input St. Maarten Radar into the ZSU Radar Mosaic System
		Identify and Access a Backup Option for Grand Turk Radar
	Technology Improvements	Investigate Option to Access Weather Information from Long Range DoD/DHS Radars
		If the Offshore Precipitation Capability (OPC) shows promise, expedite Caribbean access
		Enable ZSU to Participate in Data Comm
		Make Caribbean Radar Presentations Available to ZNY
Airspace Priorities		Explore Options to Reduce Separation between ZNY and ZSU/ZMA
		Implement a Shortcut Route between CARPX and RENAH
		Conduct an Integrated Redesign of ZMA and ZSU Airspace
		Improve Short Term Cuba Access in the Giron Corridor
		Prepare for Significant Growth in Cuba Operations
Harmonization		FAA should establish one body to develop an integrated plan and lead implementation in the Caribbean
		Maintain Active Coordination with ICAO's North America, Central America and Caribbean Offices
		Ensure Active Involvement of the Office of International Affairs, Western Hemisphere Office

A TOC member noted that in other places in the National Airspace System (NAS), technical or operational challenges are generally addressed, and why had that not happened in this region? Mr. Bertapelle noted that in the Caribbean there had been a number of stalled individual requests, such as ADS-B ground stations, new frequencies, etc. These requests had not been integrated into a holistic picture of the need for improvements in the region as a whole. Individual requests evaluated based on individual merits did not receive support but these same requests evaluated in an integrated, regional manner tell a different story and warrant priority.

Another TOC member noted that traffic to the Caribbean and South America will be growing through 2020 and the operational issues will only be exacerbated if not appropriately addressed.

Ms. Ray noted that the FAA's next step on these recommendations would be to measure associated costs and benefits. She stated that the FAA will be interested to gather operator feedback to these measurements to ensure that the benefits case for the recommendations is strong.

Another TOC member inquired about space-based ADS-B as a surveillance solution for the region. Mr. Bertapelle noted that the ERTG had considered space-based ADS-B and recognized there was risk and uncertainty associated with the technology. The ERTG did not want to distract from the ground-based option for ADS-B in the region and elected to recommend the ground solution.

Another TOC member noted the potential operational expansion into Cuba with normalizing of relations between the US and Cuba. The member inquired whether there was a need for a working group on Cuba to identify the operational challenges of significant increases of traffic between the US and Cuba. Ms. Ray noted that the growth into Cuba was indeed a priority issue within the FAA and was receiving appropriate attention at the highest levels.

Committee Action: The Committee agreed by consensus to approve the Eastern Regional Task Group Recommendations to Improve Operations in the Caribbean (Attachment 6).

GPS Adjacent Band Compatibility (ABC) Feedback on Exclusion Zones

Mr. Bob Lamond, National Business Aviation Association, and Mr. Paul McDuffee, Insitu Inc., Co-Chairs of the GPS ABC Task Group, next briefed the TOC on draft recommendations from the GPS Adjacent Band Compatibility Task Group's feedback on exclusion zones. To address the risk of GPS being unreliable in proximity of adjacent band transmissions, the FAA's GPS ABC study proposed the construct of the Exclusion Zone. Exclusion zones are cylinders around transmission towers transmitting on the GPS adjacent band within which GPS accuracy may be compromised. The power radiated from the transmitter would be limited such that GPS interference would not exceed a defined threshold at the exclusion zone boundary.

Mr. Lamond and Mr. McDuffee explained that the Task Group had been asked to provide responses to three questions:

1. The impact of Exclusion Zones on flight safety
2. The operational acceptability and safety implications of Exclusion Zones
3. Any unique considerations for small UAV operations

Mr. Lamond explained that the report's response is that Exclusion Zones negatively impact TAWS/HTAWS alerts as well as safety and operations in general. He noted that the report includes multiple case studies across various operational scenarios that highlight specific safety and operational issues associated with the exclusion zones.

Mr. Lamond also discussed that the Task Group could not define a one-size-fits-all exclusion zone that works everywhere in the NAS. The use of radio spectrum needs to be evaluated against the different NAS use cases based on the proponent's spectrum signature and density of deployment in various environments. He stated that on a case-by-case basis, a particular definition of an exclusion zone may be acceptable in terms of operations and safety. The dimensions of new zones, their location and density need to relate to the specific operational scenarios and the impact on aviation safety. Current, accurate exclusion zone location and size data would need to be readily available to operators in the NAS.

Finally, Mr. McDuffee stated that while there are multiple similarities between UAS and other operator types, particularly helicopters, some safety impacts and operational limitations from exclusion zones are unique to the unmanned nature of UAS. For example, geo-fencing, return to base, station keeping and elevated risk of loss of equipment are all more relevant to UAS with its reliance on GPS and no human within the operating vehicle to provide a visual backup.

A TOC member inquired what the process and methodology would be for operators to know the layout of all sites of exclusion zones. Members discussed that without knowledge of the zones, definitively understanding the impacts would not be possible. Finally, a TOC member noted that UAS are 100% reliant on GPS receivers and low altitude UAS make up the majority of UAS operations today.

Committee Action: The Committee agreed by consensus to approve the GPS Adjacent Band Compatibility Feedback on Exclusion Zones (Attachment 7) and sunset the GPS ABC Task Group.

Update on Airport Construction Task Group

Mr. Chris Oswald, ACI-NA, and Mr. Mark Hopkins, Delta Airlines, Co-Chairs of the Airport Construction Task Group, next provided an update to the TOC on the Airport Construction Task Group. Mr. Hopkins reviewed the tasking for the group and highlighted the six key elements of the effort:

1. Review select past airport construction projects and associated data and identify lessons learned and recommend best practices for future projects. This would include the review of available safety and efficiency data where construction issues were noted as a factor. Please recommend a mechanism to ensure we capture and share lessons learned from future projects.
2. Identify and evaluate current strategic planning initiatives/tools used by FAA stakeholders at the Headquarter, Service Area/Region, and Service Delivery Point levels and provide recommendations on a best approach.
3. Assess the use of agency orders, advisory circulars, and internal processes currently being used to guide airport sponsors in their management of airport operations during construction and provide recommendations on a best approach.
4. Identity all stakeholders internal and external to the FAA needed and define their roles in the coordination and implementation processes.
5. Describe needed outreach strategies associated with each stakeholder and include a recommended timeline for outreach for major, long term projects.
6. Identify a set of recommendations on how safety risk should be better managed for aircraft operations impacted by airport construction projects.

Mr. Oswald and Mr. Hopkins informed the TOC that the Task Group had a wide cross section of participants including flight operators, airports, various organizations with the FAA, etc. They discussed that the group was utilizing parallel efforts to conduct its data gathering, including case studies, interviews with subject matter experts and FAA-lead analysis of current Agency processes and tools.

Mr. Oswald also reviewed some initial conclusions that the Task Group was making. First, the group has noted that for smaller or less complex construction projects, there is an industry need for a clearinghouse of information on construction. He explained that such a clearinghouse would avoid scenarios in which operators learn of construction very close to the time of construction and do not have time to adjust operations.

Mr. Hopkins noted a second key conclusion that for large, complex construction projects there is a need for consistent and repeatable engagement processes in construction planning that involves the right stakeholders at right times. He noted that while the industry has improved tremendously on this over the last decade, there was opportunity for increased consistency and not “reinventing the wheel” with each new large construction effort.

TOC members discussed the numerous perspectives that are involved in airport construction, including many non-aviation focused participants. One member commented that the industry has coordination problems in construction because, in most cases, a new process is being invented for each new project. The member noted that it would make sense to build on existing experience and develop a broader and scalable process that could be re-used and improved over time. This would require checklists and timelines, though a member noted that construction projects have variable timelines and this would make defining specific timelines challenging.

Another TOC member asked specific questions about the concept of a clearinghouse. The member inquired who would own the clearinghouse, what info would need to be conveyed and who would be responsible for conveyance.

A TOC member suggested the group consider opportunities to deploying NextGen capabilities in the context of construction to both assist in mitigation of impacts as well as to push NextGen technology. One member commented that RECAT at JFK would be an example of a measure that both implemented a NextGen capability but also helped mitigate construction impacts.

Finally, a TOC member offered support for the concept of a construction clearinghouse, noting that operators learned about planned construction at Bridgeport, CT, 11 days prior to the start of construction. The case study underscored the need for reliable mechanisms to consolidate information on construction to help operators plan mitigations.

Update on National Procedure Assessment Task Group

Mr. Michael Perrizo, Air Wisconsin, and Co-Chair of the National Procedure Assessment (NPA) Task Group provided the TOC with an update on activities in the NPA Task Group. Mr. Perrizo Co-Chairs the group with Mr. Randall Burdette, Virginia Department of Aviation. He informed the TOC about the key areas of effort of the NPA Task Group:

1. Criteria for Procedure Cancelation, including both regulatory and non-regulatory tracks
2. Implementation – validate FAA's approach or recommend changes to current plans
3. Outreach
4. Recommend where to go next beyond current plan

Mr. Perrizo informed the TOC that the Task Group was in the process of data gathering and have a series of monthly meetings established through February 2016. He also reviewed the draft Terms of Reference for the Task Group and requested approval of the TORs from the TOC.

One TOC member noted that the NPA Task Group should be careful of the extent to which usage of a procedure was criteria to select a procedure for cancelation.

Committee Action: The Committee agreed by consensus to approve the National Procedure Assessment Task Group's Terms of Reference.

Discussion on Time Based Flow Management (TBFM)

Ms. Ray discussed TBFM with the TOC, as TBFM has been an ongoing subject of interest for the Committee. She noted that concerns about TBFM have included Requirements for TBFM, integration and metrics. Aspects of TBFM are anticipated to be deployed in TBFM Work Packages, including packages 3 (expected 2019) and 4 (expected 2020). A key question is whether industry would be well informed enough about these work packages to know what they need to do. For metrics, questions include what defines success and what to measure.

Ms. Ray informed the TOC that these concerns may warrant task requests to the TOC and/or CDM, and the FAA is currently in process of exploring this further.

Recommendations on Class B Airspace Designation, Design and Evaluation

Mr. Phil Santos, FedEx Express, and Ms. Melissa McCaffrey, Aircraft Owners and Pilots Association, Co-Chairs of the Class B Task Group, briefed the TOC on recommendations on Class B airspace designation, design and evaluation.

Mr. Santos and Ms. McCaffrey informed the TOC of the background of this tasking on Class B airspace. Since criteria for Class B were developed, the NAS had experienced a number of changes, including the rise and fall of some major airline hubs (STL, CVG, PIT), the growth of business aviation, cargo and low cost operators, and the increasing use of the Global Positioning System (GPS) for navigation.

Mr. Santos explained that such changes in the NAS motivated the Class B tasking which focused on the following:

1. Class B airspace designation requirements.

2. Appropriate considerations for Class B airspace design criteria.
3. The evaluation process for airspace biennial reviews including criteria to expeditiously reduce or eliminate Class B airspace that no longer meets designation requirements.
4. Obtaining input from affected users as early in the process as possible.
5. Identifying the best mechanism(s) to communicate updated processes to key stakeholders.

Mr. Santos and Ms. McCaffrey then reviewed the full set of proposed recommendations from the Class B Task Group which included the following:

Class B Issue	Recommendations
Designation of Class B Airspace	The FAA should remove the enplanement and air carrier/air taxi quantitative criteria
	Total Airport Operations Counts should also include traffic from secondary airports and overflights
	An airspace complexity index should be developed to address airspace considerations beyond that of Total Airport Operations
	Criteria should be developed for airports with strong seasonal demand surges
	Use available safety data to more directly assess airspace complexity issues and mitigations
	Provide more guidance on how operational issues can be addressed without the Class B designation
	The FAA should periodically review Class B designation criteria to determine whether they should be adjusted
Modification of Class B Airspace	Remove existing guidance indicating design should be centered on a NAVAID and amend guidance to ensure designers leverage the flexibility to configure airspace that maintains Class B safety standards
	Require a review of Class B airspace and instrument procedures whenever new runways are built, existing runway changes occur (e.g. decommissioned, lengthened, or shortened) or when procedures are developed or old ones canceled
	Encourage designers to make maximum use of existing tools to accommodate VFR flights through or around Class B airspace
	Evaluate lateral and vertical gaps between adjacent airspace where VFR flight has the potential to increase hazards for Class B or Class C operations
	Recommend introduction of an altitude buffer between protected IFR airplanes and VFR aircraft
	Ensure all Class B Terminal Area Charts include information on IFR arrival/departure routes to/from the primary airport and explore possibility of extending to include secondary airports
Evaluation of Class B Airspace	Update FAA Order 7400.2 with additional guidance on data sources relevant for the biennial review
	Develop criteria for identifying when Class B airspace should be revoked

	Outline a process for revoking Class B airspace
Recommendations on the Process for External Engagement on Changes to Class B Guidance	Conduct further public engagement before implementation of any design, designation and evaluation changes to Class B guidance
	Whether communicating draft language or a Final Rule of changes to the Class B guidance, the group recommends the FAA utilize one centralized and consistent package of information across all public engagements

A TOC member noted for the fourth recommendation above that the recommendation addressed seasonal demand surges but did not address time-of-day demand surges, such as those experienced at a night time cargo hub operation. The member inquired whether that recommendation could be broadened to include consideration of Class B for airports with time-of-day demand surges. Co-Chair Bowman suggested amending recommendation number four to include both seasonal and time-of-day demand surges in the statement, and TOC members provisionally accepted this amendment. Mr. Bowman elected to keep the Class B recommendation report open with this provisional change to the fourth recommendation. However, the question of adjusting the language to the recommendation would be sent back to the Class B Task Group for consideration.

Committee Action: The Committee requested the Class B Task Group to consider amending recommendation #4 in the draft report Class B Airspace Designation, Design and Evaluation (Attachment 8) to incorporate time of day considerations as well as seasonal considerations and then report back to the TOC.

Adjourn

Chairman Bowman ended the meeting of the Committee at 3:30 p.m.

Next Meeting

The next meeting of the TOC is November 12, 2015 in Washington, DC.

Attendees: July 21, 2015 Meeting of the Tactical Operations Committee
Washington, DC

Name[1]	Company
Perrizo, Michael	Air Wisconsin
Duke, Rune	Aircraft Owners and Pilots Association
McCaffrey, Melissa	Aircraft Owners and Pilots AssociationMelissa
Oswald, Chris	Airports Council International (ACI North America)
Bradley, Mark	Delta Air Lines, Inc.
Hopkins, Mark	Delta Air Lines, Inc.
Narvid, Colonel Juan	DoD Policy Board on Federal Aviation
Steinbicker, Mark	Federal Aviation Administration
Ray, Lynn	Federal Aviation Administration
Briggs, Hazen	Federal Aviation Administration
Fraticelli, Felipe	Federal Aviation Administration
Gay, Trish	Federal Aviation Administration
Pfingstler, Susan	Federal Aviation Administration
Webb, Jim	Federal Aviation Administration
Williams, Lynn	Federal Aviation Administration
Santos, Phil	FedEx Express
Bowman, Jim	FedEx Express
Cardwell, Mark	FedEx Express
McDuffee, Paul	Insitu, Inc.
Murphy, Bill	International Air Transport Association
Roberts, Bart	JetBlue Airways
Bertapelle, Joe	JetBlue Airways
Rubin, Mitch	National Air Traffic Controllers Association
Lamond Jr, Bob	National Business Aviation Association
Jenny, Margaret	RTCA, Inc.
Mitra, Trin	RTCA, Inc.
Dalton, Rick	Southwest Airlines
Solley, Edwin	Southwest Airlines
Brandt, John	The MITRE Corporation
Moch-Mooney, Deborah	The MITRE Corporation
Molin, Doug	The MITRE Corporation
Emden, Philip	United Airlines, Inc.
Kast, Christian	United Parcel Service

[1]Committee member names appear in italics.

THE GOLD STANDARD FOR AVIATION SINCE 1935

RTCA Tactical Operations Committee

Tenth Meeting

July 21, 2015

RTCA Headquarters

THE GOLD STANDARD FOR AVIATION SINCE 1935

Welcome and Introduction

Co-Chair:

Jim Bowman, FedEx Express

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Topical Agenda

- FAA Report
- Four Recommendations
  - NOTAM Task Group: Review of NOTAM Search Phase 2 Implementation
  - Eastern Regional Task Group: Recommendations to Improve Operations in the Caribbean
  - GPS ABC Task Group: Feedback on Exclusion Zones
  - Class B Task Group: Designation, Design and Evaluation of Class B Airspace
- Two Updates
  - Update from Airport Construction Task Group
  - Update from National Procedure Assessment Task Group
- Potential TBFM Tasking Update

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PUBLIC MEETING ANNOUNCEMENT
Read by: Designated Federal Official Elizabeth Ray
Tactical Operations Committee (TOC)
July 21, 2015

In accordance with the Federal Advisory Committee Act, this Advisory Committee meeting is OPEN TO THE PUBLIC.

Notice of the meeting was published in the Federal Register on:

June 26, 2015

Members of the public may address the committee with PRIOR APPROVAL of the chairman. This should be arranged in advance.

Only appointed members of the Advisory Committee may vote on any matter brought to a vote by the Chairman.

The public may present written material to the Advisory Committee at any time.

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Review and Approval of:

May 20, 2014
Meeting Summary

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FAA Report

Elizabeth “Lynn” Ray

Vice President, Mission Support Services

Air Traffic Organization

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TOC Award Winners for Outstanding Leadership

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NOTAM Task Group: Review of NOTAM Search Phase 2 Implementation

Mark Cardwell, FedEx Express

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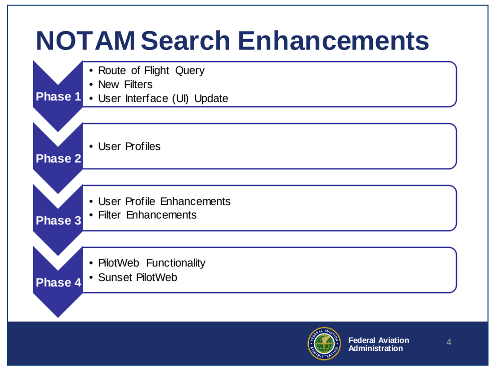
Recent History

- In August 2014, FAA published a four phase implementation plan for NOTAM Search
- As of late June 2015, three phases now complete
- NOTAM Task Group met in May 2015 to review Phase 2 of implementation



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Task Group Members

- Darrell Pennington, Air Line Pilots Association
- **Tom Kramer, Aircraft Owners and Pilots Association (Co-Chair)**
- Des Keany, American Airlines, Inc.
- Jocelyn Cox, CNA
- Steve Habicht, CNA
- Shaelynn Hales, CNA
- Jack Hurley, Delta Air Lines, Inc.
- Fred Anderson, Federal Aviation Administration
- Ernie Bilotto, Federal Aviation Administration
- Gary Bobik, Federal Aviation Administration
- Dave Bradshaw, Federal Aviation Administration
- Trish Gay, Federal Aviation Administration
- Brian Hint, Federal Aviation Administration
- Lynette Jamison, Federal Aviation Administration
- Scott Jerdan, Federal Aviation Administration
- Bob McMullen, Federal Aviation Administration
- Diana Young, Federal Aviation Administration
- **Mark Cardwell, FedEx Express (Co-Chair)**
- David von Rinteln, Hewlett Packard
- Michael Williams, Hewlett Packard
- Jeffrey Miller, International Air Transport Association
- Jon Reisinger, Jeppesen
- Aaron Wood, Jeppesen
- Ashish Solanki, Maryland Aviation Administration
- Mark Prestrude, National Air Traffic Controllers Association
- Rich Boll, National Business Aviation Association
- Bob Lamond Jr, National Business Aviation Association
- Trin Mitra, RTCA, Inc.
- David Newton, Southwest Airlines
- Edwin Solley, Southwest Airlines
- Ezra Jalleta, The MITRE Corporation
- Jim Mills, U.S. Air Force
- Christian Kast, United Parcel Service

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Feedback to Phase 2 Implementation

- ***Training Videos***: include narration in Training Videos as long as no other elements of implementation are displaced
- ***Selection of ARTCC NOTAMs or TFR NOTAMs***: clarify to user that ARTCC is superset and TFR subset (already part of FAA next steps)
- ***Search by Accountability***: less known category that requires enhanced explanation in User Guide
- ***Communicating Planned Enhancements***: recommend FAA include list of planned future enhancements directly on the NOTAM Search webpage

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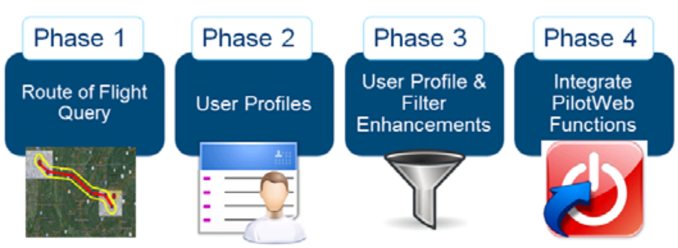
Next Steps

- Phase 4 release date in September 2015
- NOTAM TG to review Phase 3/4 in October and provide report to TOC in November meeting
- No defined tasks for group after November



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Review of NOTAM Search Phase 2 Implementation

DISCUSSION

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TOC Action

Consider Recommendation on:

Review of NOTAM Search Phase 2 Implementation

and Transmit to FAA

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Eastern Regional Task Group: Recommendations to Improve Operations in the Caribbean

Joe Bertapelle, JetBlue

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Background to ERTG Tasking

- Ongoing stakeholder concern regarding safety and operational performance in the Caribbean

Report refers to ZMA "Oceanic," IAW ICAO doc 7030 CAR region, to describe the non-domestic airspace over the ocean. Surveillance capabilities and direct pilot controller radio communication allow the application of domestic separation standards.

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The Task Request

- **Problem Identification**: the use of data to clearly define the problem, causes and solutions to the safety, efficiency and capacity issues in the region.
- **Infrastructure**: prioritized solutions for any infrastructure components identified as most critical to improving/enhancing operations in the region.
- **Airspace**: prioritized solutions for any airspace improvements or enhancements as needed.
- **Harmonization**: a review of existing or planned domestic or international activities in the region and a recommended method or mechanism to insure all the work is harmonized into a comprehensive and coherent master plan.

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The Task Group

- Mark Cato, Air Line Pilots Association
- JP Lazo, Air Line Pilots Association
- Brian Gonzalez, American Airlines, Inc.
- Tim Stull, American Airlines, Inc.
- Rico Short, Beacon Management Group
- David Houck, Delta Air Lines, Inc.
- Bob Oberstar, Delta Air Lines, Inc.
- David Vogt, Delta Air Lines, Inc.
- Lindsay Adrian, Federal Aviation Administration
- Doug Arbuckle, Federal Aviation Administration
- Mike Artist, Federal Aviation Administration
- Christopher Barks, Federal Aviation Administration
- Krista Berquist, Federal Aviation Administration
- Charles Blackwell, Federal Aviation Administration
- LaGretta Bowser, Federal Aviation Administration
- Jorge Chades, Federal Aviation Administration
- Raul Chong, Federal Aviation Administration
- Janice Deak, Federal Aviation Administration
- Dan Eaves, Federal Aviation Administration
- Felipe Fraticelli, Federal Aviation Administration
- Josue Gonzalez, Federal Aviation Administration
- Geoffrey Lelliott, Federal Aviation Administration
- Curtis Lineberry, Federal Aviation Administration
- Paul Lore, Federal Aviation Administration
- Robert Novia, Federal Aviation Administration
- Mark Palazzo, Federal Aviation Administration
- Mike Polchert, Federal Aviation Administration
- Joe Rather, Federal Aviation Administration
- Mike Richardson, Federal Aviation Administration
- Ed Rodgriguez, Federal Aviation Administration
- John Vinyard, Federal Aviation Administration
- Madison Walton, Federal Aviation Administration
- Jim Webb, Federal Aviation Administration
- Phil Santos, FedEx Express
- Jeffrey Miller, International Air Transport Association
- **Joe Bertapelle, JetBlue Airways (Co-Chair)**
- Thomas Lloyd, JetBlue Airways
- Woody Camp, National Air Traffic Controllers Association
- John Fox, National Air Traffic Controllers Association
- William L Geoghagan, National Air Traffic Controllers Association
- Greg Harris, National Air Traffic Controllers Association
- Dean Snell, National Business Aviation Association
- Ralph Tamburro, Port Authority of New York & New Jersey
- Kalyan Bala, RTCA, Inc.
- Trin Mitra, RTCA, Inc.
- Edwin Solley, Southwest Airlines
- Eric Eibe, U.S. Air Force
- Bill Cranor, United Airlines, Inc.
- **Glenn Morse, United Airlines, Inc. (Co-Chair)**
- Jim Hamilton, United Parcel Service

Note: list includes anyone who attended at least one TG meeting or made contributions to the final report

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Task Group Representation

- Air Line Pilots Association (ALPA)
- Department of Defense (DoD)
- FAA
  - Air Traffic International Office, Americas Group
  - Eastern Service Center – Planning and Requirements Group (PRG) and Operations Support Group (OSG)
  - Management and NATCA personnel from impacted NAS facilities – New York Air Route Traffic Control Center (ZNY), Miami Air Route Traffic Control Center (ZMA) and San Juan Combined Center/Radar Approach Control (ZSU)
  - Manager of Tactical Operations (MTO) for the Southeast
  - Oceanic and Offshore Standards and Procedures Group
  - Office of International Affairs, Western Hemisphere Office
  - Surveillance and Broadcast Systems (SBS) Office
- International Air Transport Association (IATA)
- Major scheduled and cargo air carriers in the region
- National Air Traffic Controllers Association (NATCA)
- National Business Aviation Association (NBAA)

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What's driving need in Caribbean?

- Current and Projected Growth
- Funnel Effect of Caribbean Traffic
- Infrastructure Issues
- Airspace Structure Not Aligned to Traffic Demand
- Regional Coordination Challenges

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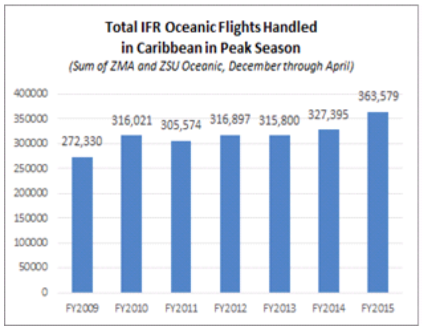
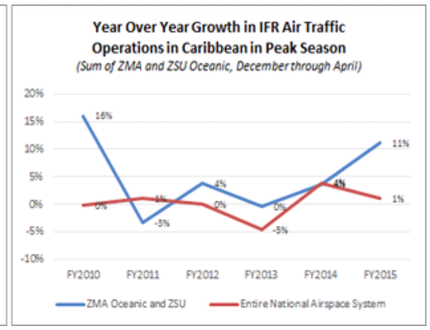
Current Growth

- Historical growth in the Caribbean during 7 consecutive years of reduced facility operations in the NAS:



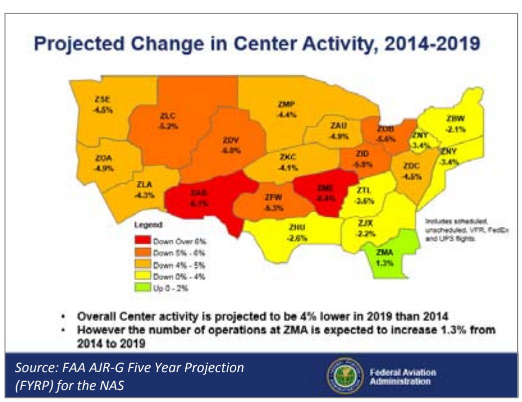


Source: OPSENT data, Aviation System Performance Metrics (ASPM)

21

Projected Growth

- FAA Performance Analysis Group projects ZMA only Center projected to grow by 2019
- ZSU expectations are similar



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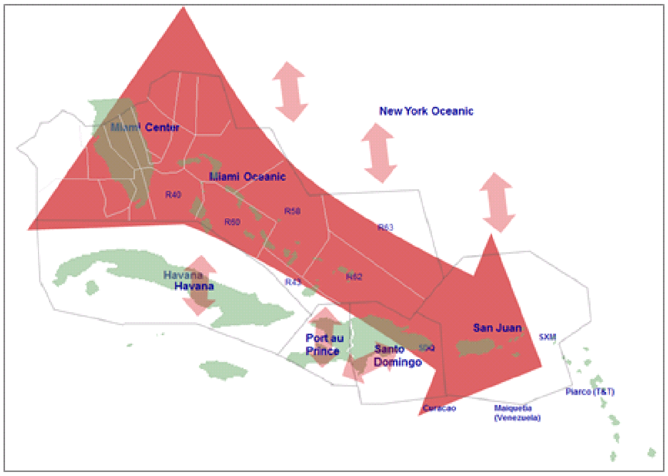
Funnel Effect of Caribbean Traffic

- Growing traffic traversing a static funnel



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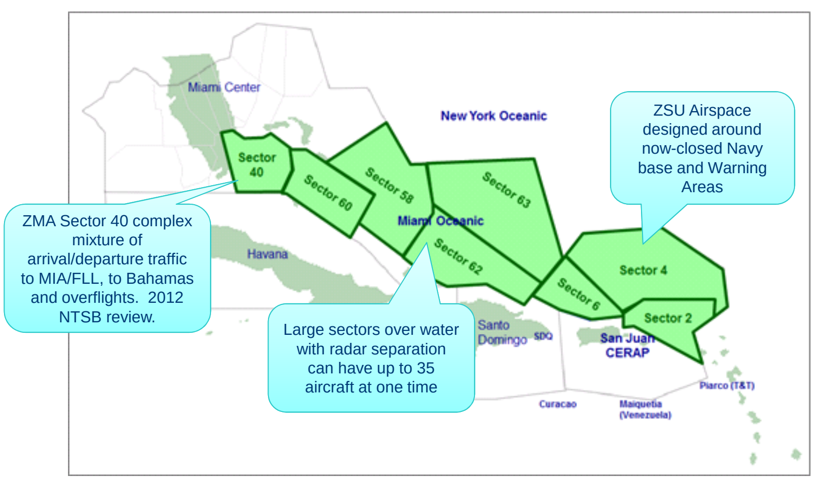
Airspace Concerns

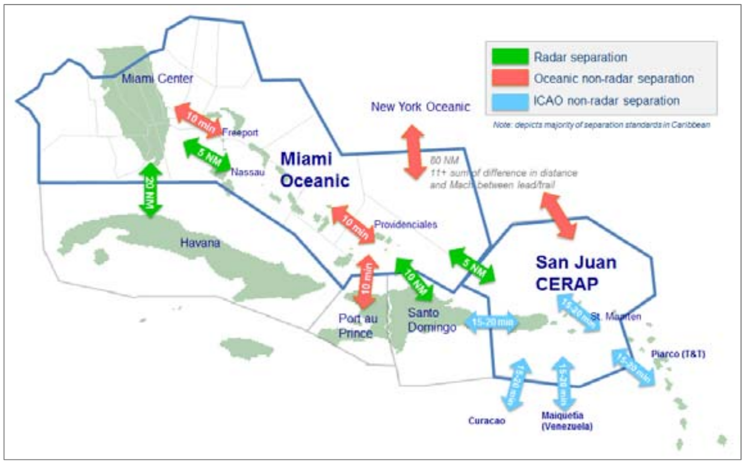
- Variety of Airspace related issues in Caribbean



24

Multiple Separation Transitions

- Infrastructure variability drives complex mix of separations



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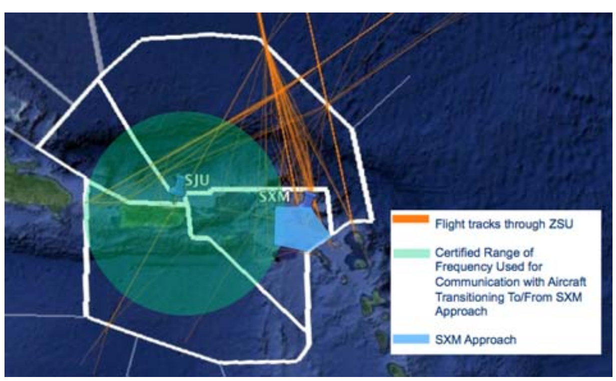
Communications Gaps

- Drive increased separation for contingency managements



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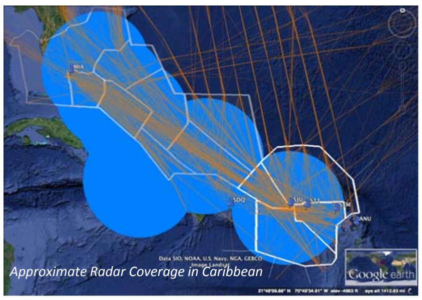
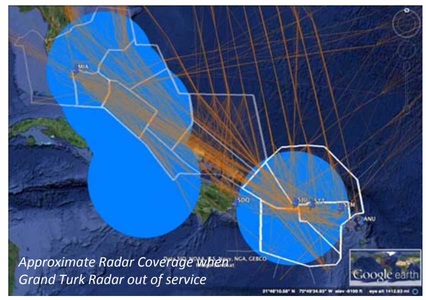
Single Points of Failure/ Lack of Redundancy

- E.g., when Grand Turk radar out of service, creates significant reroutes





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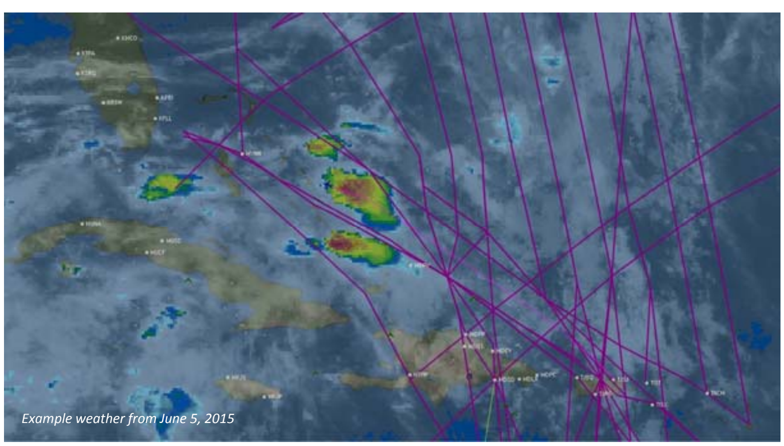
Weather Information Gaps

- Can result in Workload and Safety hazards



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ERTG Recommendations Overview

Category		Prioritized Recommendations
Infrastructure Priorities	Communications	Implement a New Communications Frequency at Saint Maarten
		Implement a New Communications Frequency at Abaco Island
		Install Dedicated Shout Lines with Certain Adjacent or Underlying International Facilities
	Automation	Regional Implementation of Automation: 1. Continue implementation of ADE with Santo Domingo 2. Develop software translation for neighboring facilities with AIDC protocol 3. Ensure ERAM software upgrades associated with ADE stay on schedule
		Implement Independent Flight Data Processing in ZSU
	Surveillance	Implement ADS-B in the Caribbean
		Input St. Maarten Radar into the ZSU Radar Mosaic System
		Identify and Access a Backup Option for Grand Turk Radar
	Technology Improvements	Investigate Option to Access Weather Information from Long Range DoD/DHS Radars
		If the Offshore Precipitation Capability (OPC) shows promise, expedite Caribbean access
		Enable ZSU to Participate in Data Comm
		Make Caribbean Radar Presentations Available to ZNY

Category	Prioritized Recommendations
Airspace Priorities	Explore Options to Reduce Separation between ZNY and ZSU/ZMA
	Implement a Shortcut Route between CARPX and RENAH
	Conduct an Integrated Redesign of ZMA and ZSU Airspace
	Improve Short Term Cuba Access in the Giron Corridor
	Prepare for Significant Growth in Cuba Operations
Harmonization	FAA should establish one body to develop an integrated plan and lead implementation in the Caribbean
	Maintain Active Coordination with ICAO's North America, Central America and Caribbean Offices
	Ensure Active Involvement of the Office of International Affairs, Western Hemisphere Office

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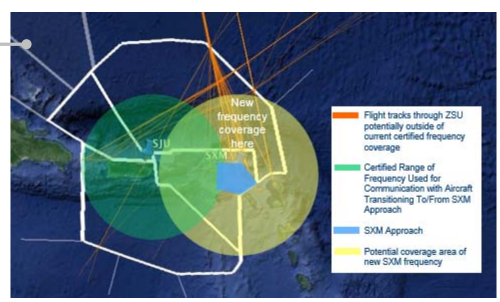
Infrastructure: Communications

Recommendations

- Implement a New Communications Frequency at Saint Maarten
- Implement a New Communications Frequency at Abaco Island
- Install Dedicated Shout Lines with Certain Adjacent or Underlying International Facilities



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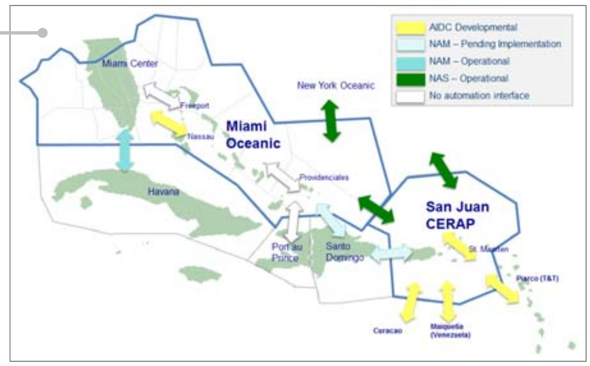
Infrastructure: Automation

Recommendations

- Regional Implementation of Automation:
  - Continue implementation of ADE with Santo Domingo
  - Develop software translation for neighboring facilities with AIDC protocol
  - Ensure ERAM software upgrades associated with ADE stay on schedule
- Implement Independent Flight Data Processing in ZSU

Automation Interface Protocols between/within NAS and Foreign Facilities in Caribbean



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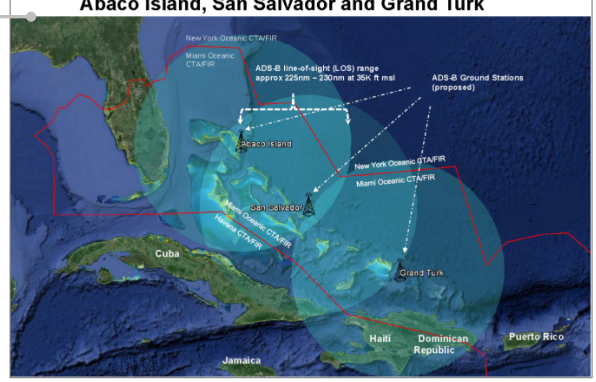
Infrastructure: Surveillance

Recommendations

- Implement ADS-B in the Caribbean
- Input St. Maarten Radar into the ZSU Radar Mosaic System
- Identify and Access a Backup Option for Grand Turk Radar

ADS-B Coverage at 35K MSL with Ground Stations at Abaco Island, San Salvador and Grand Turk



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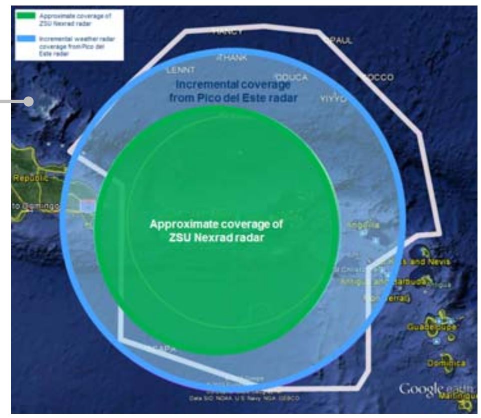
Infrastructure: Technology Improvements

Recommendations

- Investigate Option to Access Weather Information from Long Range DoD/DHS Radars
- If the Offshore Precipitation Capability (OPC) shows promise, expedite Caribbean access
- Enable ZSU to Participate in Data Comm
- Make Caribbean Radar Presentations Available to ZNY



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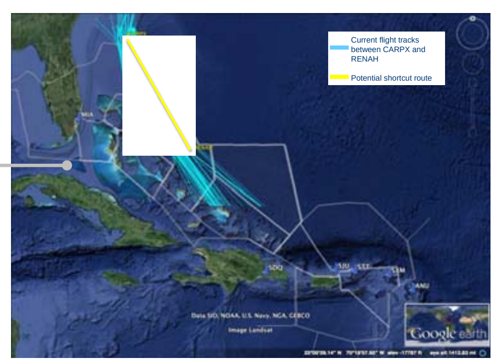
Airspace

Recommendations

- Explore Options to Reduce Separation between ZNY and ZSU/ZMA
- Implement a Shortcut Route between CARPX and RENAH
- Conduct an Integrated Redesign of ZMA and ZSU Airspace
- Improve Short Term Cuba Access in the Giron Corridor
- Prepare for Significant Growth in Cuba Operations



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Harmonization

Recommendations

- FAA should establish one body to develop an integrated plan and lead implementation in the Caribbean
- Maintain Active Coordination with ICAO's North America, Central America and Caribbean Offices
- Ensure Active Involvement of the Office of International Affairs, Western Hemisphere Office

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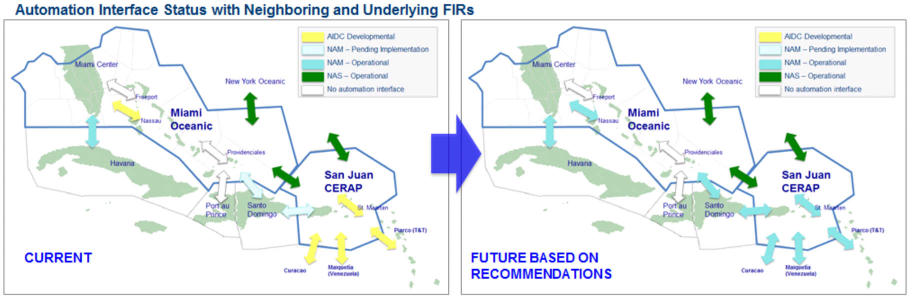
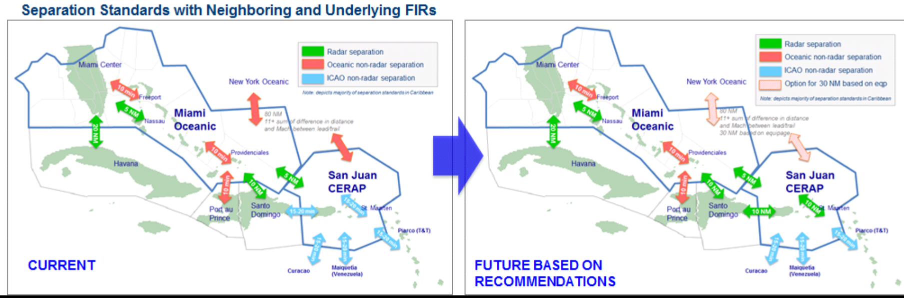
Impact of Recommendations

Automation Interface Status with Neighboring and Underlying FIRs



Separation Standards with Neighboring and Underlying FIRs



Recommendations to Improve Operations in the Caribbean

DISCUSSION

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TOC Action

Consider Recommendation on:

Recommendations to Improve Operations in the Caribbean

and Transmit to FAA

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GPS ABC Task Group: Feedback on Exclusion Zones

Bob Lamond, NBAA
Paul McDuffee, Insitu Inc.

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Background of the Task

- Jan 2012: National Space-Based Positioning, Navigation and Timing Executive Committee (PNT-EXCOM) proposed drafting of new GPS spectrum interference standards to inform future proposals for non-space commercial uses in frequency bands adjacent to GPS
- DOT/DoD decide to study new GPS spectrum interference standards
- Oct 2014: FAA published "GPS Adjacent-Band Compatibility Study Methodology and Assumptions"
  - Much of study focuses on analysis methodologies, aviation GPS receiver characteristics, RFI propagation path models, basic source emission parameters and interaction scenarios
  - ***One section on operational impacts***
  - ***RTCA asked by FAA to review study and answer 6 specific questions – three given to SC 159, three to the TOC***

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The Exclusion Zone

- To address risk of GPS being unreliable in proximity of adjacent band transmissions, the GPS ABC Study proposed the construct of the Exclusion Zone.
- Exclusion Zone is a cylinder around a transmission tower within which GPS accuracy may be compromised.
- The power radiated from the transmitter would be limited such that GPS interference would not exceed a defined threshold at the exclusion zone boundary.

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Exclusion Zones

Aircraft Type	Distance from Airport	Min Obstacle Height	Exclusion Zone
Fixed Wing	Within 7.5 nm	100 ft AGL	• Intersection of a cylinder centered on the obstacle (500' in radius and extending 100' above the top of the obstacle) and the region below the obstacle clearance surfaces (as defined by the FAA 8260 series orders) for all instrument procedures. *The exclusion zone extends down to the minimum altitude where coverage would be required by paragraph 1c, d, or e above.*
Fixed Wing	Greater than 7.5 nm	200 ft AGL	• a cylinder centered on the transmitter (500' in radius and 100' above the top of the obstacle), but not above 1000' AGL (including effects of falling terrain). *The exclusion zone extends down to the minimum altitude where coverage would be required by paragraph 1c, d, or e above*
Helicopter	n/a	100 ft AGL	• is the intersection of a cylinder centered on the obstacle (500' in radius and extending 100' above the obstacle) and the region below the obstacle clearance surfaces (as defined by the FAA 8260 series orders) for all instrument procedures. The exclusion zone extends down to 100' AGL.

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Three Questions for the TOC

- Impact of Exclusion Zones on Flight Safety
  - Question #4 to RTCA: (c) Are the size and aggregated density of aircraft and helicopter exclusion zones where GPS-based TAWS/HTAWS alerts cannot be assured (Appendix C, section above, and reference [4]) sufficiently small so as to not impact flight safety? (d) Alternatively, what TAWS/HTAWS exclusion zones parameters should be considered?
- Operational Acceptability and Safety Implications
  - Question #5 to RTCA: Comments are requested regarding the operational acceptability and safety implications for the proposed exclusions, operational limitations and safety considerations identified in Appendix C of this report and Annex A of the reference [4] report including any alternative suggestions and supporting rationale.
- Unique Considerations for Small UAV Operations
  - Question #6 to RTCA: (a) Considering the proposed fixed and rotary wing aircraft assumptions, exclusions, and limitations, are there safety impacts and operational limitations that are unique to small Unmanned Aircraft Vehicles (UAVs) operations? (b) If yes, please identify the unique operational use case scenarios and any associated safety and operational issues. (c) Propose additional assumptions and "exclusion zones" for consideration that would preclude the identified safety and operational issues (if any).

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Task Group Members

- Clay Barber, Garmin International
- Mark Cato, Air Line Pilots Association
- Perry Clausen, Southwest Airlines
- Santanu Dutta, LightSquared, Inc.
- Rob Eagles, International Air Transport Association
- John Foley, Garmin AT
- William Geoghagan, National Air Traffic Controllers Association
- Larry Hills, FedEx Express
- Robert Ireland, Airlines for America
- Margaret Jenny, RTCA
- Bob Lamond, National Business Aviation Association (Co Chair)
- Kelly Markin, The MITRE Corporation
- Paul McDuffee, Insitu Inc. (Co Chair)
- Ben Miller, Mesa County, CO Sheriffs Department
- Trin Mitra, RTCA
- Harold Moses, RTCA
- Kieran O'Carroll, International Air Transport Association
- Ajay Parikh, LightSquared, Inc.
- Paul Railsback, Airlines for America
- Melissa Rudinger, Aircraft Owners and Pilots Association
- Geoff Stearn, LightSquared, Inc.
- Harold Summers, Helicopter Association International
- Gary Viviani, Insitu Inc.

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Key Observations & Assumptions

- Exclusion Zone does not imply that an operator “shall not” operate in the zone; implies GPS unreliable inside
- No mechanism to notify operators of the location of all exclusion zones where GPS will be unreliable
- Location, count, density of transmitter sites have significant relationship to impact on ops and safety
- Transmitters will not be installed within confines of protected airspace associated with arrivals/departures
- No change of legacy equipage on aircraft, manned or unmanned, is assumed
- Any emissions from any towers would be restricted to not interfere with aircraft at or above 1000 ft AGL

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Impacts to Helicopters

- Key impacts of Exclusion Zones
  - Navigation
  - Obstacle avoidance
  - Relaying position to other collaborative units
  - Particularly relevant in helicopter propensity for nape-of-the-earth operations
- Specific Scenarios
  - Emergency Medical Services (EMS)
  - Law Enforcement
  - Fire
  - Other

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Impacts to Unmanned Aerial Systems (UAS)

- Key impacts of Exclusion Zones
  - Geo fencing
  - Lose C2 Link/Return to Base
  - Station Keeping/Payload
  - Loss of Equipment
- Specific Scenarios
  - Visual Range: Aerial photography (e.g., real estate, wedding), Land surveying (construction, land management), News gathering (e.g., sports), Agriculture (crop monitoring, livestock management), Tactical support for First responders
  - Beyond Visual Range: above scenarios as well as Parcel delivery, Right-of-way inspections (pipeline, rail), Traffic management, Security, First responders (e.g., search and rescue)

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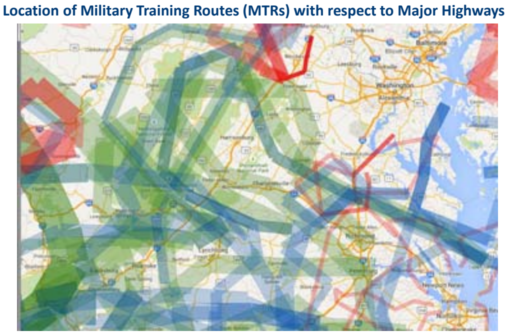
Impacts to the Military

- Key impacts of Exclusion Zones
  - Navigation during low level, high speed training operations or within Special Use Airspace
  - Risk to communities underlying low level, high speed training operations
  - Guidance for weapons systems

Location of Military Training Routes (MTRs) with respect to Major Highways



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Impacts to GA Fixed Wing

- Key impacts
  - Navigation
  - Obstacle avoidance
  - Operational effectiveness (agriculture)
  - Impacts to unpublished private approaches (private airport operations)
- Specific Scenarios
  - Agriculture Operations
  - Ultra Light and Light-Sport Aircraft (LSA) Operations
  - General Aviation Operations In and Out of Public Airports
  - General Aviation Operations In and Out of Private Airports

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Response to Q4: Impact of Exclusion Zones on Flight Safety

Question: (c) Are the size and aggregated density of aircraft and helicopter exclusion zones where GPS-based TAWS/HTAWS alerts cannot be assured (Appendix C, section above, and reference [4]) sufficiently small so as to not impact flight safety? (d) Alternatively, what TAWS/HTAWS exclusion zones parameters should be considered?

- (4c) The Exclusion Zones proposed in the October 2014 “GPS Adjacent-Band Compatibility Study Methodology and Assumptions” study negatively impacts GPS-based TAWS/HTAWS alerts.
- (4d) The response to question 5 addresses question 4d.

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Response to Q5: Operational Acceptability & Safety Implications

Question 5: Comments are requested regarding the operational acceptability and safety implications for the proposed exclusions, operational limitations and safety considerations identified in Appendix C of this report and Annex A of the reference [4] report including any alternative suggestions and supporting rationale.

- The Exclusion Zones proposed in the Oct 2014 GPS ABC study have negative impacts to both flight safety and operations for multiple operational scenarios as documented in the operational scenarios presented in this report.
- Additionally, the exclusion zones as defined only go as low as 100 feet AGL and there are some scenarios (Agriculture, UAS) that have negative impacts below 100 feet AGL.

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Response to Q5: Operational Acceptability & Safety Implications

Question 5: …alternative suggestions and supporting rationale.

- The group acknowledges that some level of GPS interference exists in the NAS today. Examples include shadowing, solar flares, DoD jamming, unintended emissions from radio transmitters, etc.
- However, the group cannot define a one-size-fits-all exclusion zone that works everywhere in the NAS. The use of radio spectrum needs to be evaluated against the different NAS use cases based on the proponent's spectrum signature and density of deployment in various environments.
- On a case-by-case basis, a particular definition of an exclusion zone may be acceptable in terms of operations and safety. The dimensions of new zones, their location and density need to relate to the specific operational scenarios and the impact on aviation safety. Current, accurate exclusion zone location and size data would need to be readily available to operators in the NAS.

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Response to Q6: Unique Considerations for Small UAV

Question: (a) Considering the proposed fixed and rotary wing aircraft assumptions, exclusions, and limitations, are there safety impacts and operational limitations that are unique to small Unmanned Aircraft Vehicles (UAVs) operations? (b) If yes, please identify the unique operational use case scenarios and any associated safety and operational issues. (c) Propose additional assumptions and "exclusion zones" for consideration that would preclude the identified safety and operational issues (if any).

- (6a-b) While there are multiple similarities between UAS and other operator types, particularly helicopters, some safety impacts and operational limitations from exclusion zones are unique to the unmanned nature of UAS. For example, geo-fencing, return to base, station keeping and elevated risk of loss of equipment are all more relevant to UAS with its reliance on GPS and no human within the operating vehicle to provide a visual backup.
- Finally, the UAS segment of aviation is also unique because of its current rapid growth and maturation.
- The details of UAS-specific impacts are contained in the operational scenarios discussed above.
- (6c) Please see the response to question 5 above. Additionally, exclusion zone definitions will be dependent upon receiver design resiliency and there is no standard for UAS.

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GPS ABC Task Group Feedback on Exclusion Zones

DISCUSSION

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TOC Action

Consider Recommendation on:

GPS ABC Task Group
Feedback on Exclusion Zones

Transmit to FAA and
Sunset the GPS ABC Task Group

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RTCA
THE GOLD STANDARD FOR AVIATION SINCE 1935

Lunch

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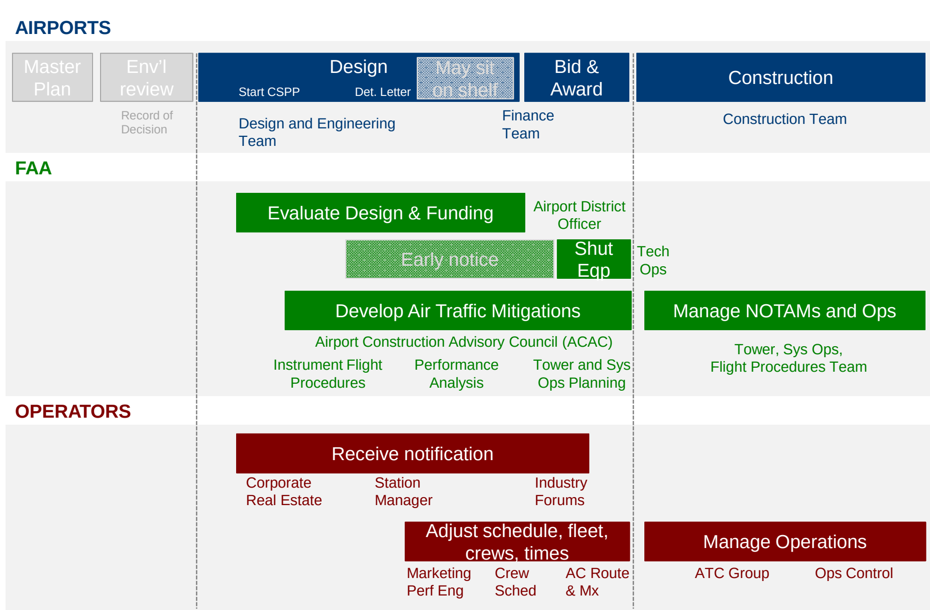
RTCA
THE GOLD STANDARD FOR AVIATION SINCE 1935

Update from Airport Construction Task Group

Mark Hopkins, Delta
Chris Oswald, ACI-NA

57

Airport Construction is Complex



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Airport Construction Tasking

1. Lessons Learned (Case Studies)	1.	Review select past airport construction projects and associated data and identify **lessons learned and recommend best practices** for future projects. This would include the review of available safety and efficiency data where construction issues were noted as a factor. Please recommend a mechanism to ensure we capture and share lessons learned from future projects.
2. Evaluate FAA Planning Tools	2.	Identify and **evaluate current strategic planning initiatives/tools used by FAA** stakeholders at the Headquarter, Service Area/Region, and Service Delivery Point levels and provide recommendations on a best approach.
3. Evaluate FAA Processes	3.	**Assess the use of agency orders, advisory circulars, and internal processes** currently being used to guide airport sponsors in their management of airport operations during construction and provide recommendations on a best approach.
4. Understand Stakeholders	4.	**Identity all stakeholders internal and external** to the FAA needed and define their roles in the coordination and implementation processes.
5. Outreach Strategies	5.	Describe **needed outreach strategies** associated with each stakeholder and include a recommended timeline for outreach for major, long term projects.
6. Managing Safety Risk	6.	Identify a set of **recommendations on how safety risk should be better managed** for aircraft operations impacted by airport construction projects.

The FAA requests this task be completed by the 2nd Quarter, FY2016 TOC meeting – March 2016

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Task Group Membership

- Steve Jangelis, Air Line Pilots Association
- Richard Kessel, Air Line Pilots Association
- Melissa Rudinger, Aircraft Owners and Pilots Association
- Frank Oley, Airlines for America
- Chris Oswald, Airports Council International
- Eric Silverman, American Airlines, Inc.
- Justin Towles, American Association of Airport Executives
- Rico Short, Beacon Management Group
- Paul Martinez, Dallas/Fort Worth International Airport
- Mark Hopkins, Delta Air Lines, Inc.
- Jim Marcoux, Delta Air Lines, Inc.
- John Dermody, Federal Aviation Administration
- Kent Duffy, Federal Aviation Administration
- Freddie James, Federal Aviation Administration
- Jeffrey Jones, Federal Aviation Administration
- Khalil Kodsi, Federal Aviation Administration
- Andrew Lamb, Federal Aviation Administration
- Vered Lovett, Federal Aviation Administration
- Jennifer Morris, Federal Aviation Administration
- Pat Mulqueen, Federal Aviation Administration
- Susan Pfingstler, Federal Aviation Administration
- Dave Siewert, Federal Aviation Administration
- Tony Tisdall, Federal Aviation Administration
- Beverly Tulip, Federal Aviation Administration
- Lynn Williams, Federal Aviation Administration
- Greg Yamamoto, Federal Aviation Administration
- Bill Murphy, International Air Transport Association
- Lee Brown, Landrum-Brown
- Celia Fremberg, Landrum-Brown
- Paul Shank, Maryland Aviation Administration
- Vincent Cardillo, Massachusetts Port Authority
- Ric Loewen, National Air Traffic Controllers Association
- Ralph Tamburro, Port Authority of New York & New Jersey
- Trin Mitra, RTCA, Inc.
- Bob Flynn, The MITRE Corporation
- Glenn Morse, United Airlines, Inc.

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Parallel Efforts to Identify Gaps

- Case Studies
  - Identify what went well and what did not go well
- SME Interviews
  - Within Task Group
  - Document stakeholder perspectives and identify gaps
- Evaluation of existing Tools and Processes
  - Lead by FAA within Task Group

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Task Group Visit to BWI on July 9th

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Case Study Plan

- Visit to BWI on July 9th
- Plan to review "successful" efforts
  - FLL New Runway
  - ATL Runway Replacment
- Plan to review "less successful" efforts
  - Runway closure at 2nd tier airport with two week notice
  - Loss of Cat II/III due to movement of Localizer at 2nd tier airport with six weeks' notice
  - Loss vertical guidance at 2nd tier airport with extensive cargo operations
  - LAX NOTAMs/Cranes on Feb 5, 2015
- **Other ideas from TOC?**

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Task Group SME Interviews

- **Airline Planning Discussion (May 21)**
  Participants: Hopkins, Silverman, Marcoux, Oswald, Siewert, Morse, Duffy
- **FAA Operations Planning Discussion (May 21)**
  Participants: Morris, Marcoux, Pfingstler, Siewert, Yamamoto, Kodsi, Mulqueen, Morse, Oswald
- **Safety SME Discussion (May 26)**
  Participants: Kessel, Hopkins, Jangelis, James, Pfingstler, Morse, Dermody, Kodsi
- **Airport Operator Discussion (May 26)**
  Participants: Hopkins, Tamburro, Kodsi, Morse, Oswald
- **Airport Planning Discussion (May 28)**
  Participants: Oswald, Hopkins, Morse, Kodsi
- **FAA Procedures (Jun 30)**
  Participants: Tulip, Mulqueen, Yamamoto, Oswald, Morse, Hopkins, Kodsi
- **FAA Tech Ops (Jul 1)**
  Participants: Jones, Kodsi, Hopkins, Oswald, Williams, Morse
- **Airline Operations (Jul 1)**
  Participants: Oley, Byham, Hopkins, Kodsi, Morse

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Observation #1: A wide continuum of construction projects…

Large Airport, Longer, Complex

- Well known projects
  - LAX/JFK known by all
  - Others known by hub carriers
  - Non-hub carrier awareness an issue?

2nd Tier Airport, Shorter, Less Complex

- Funding variability more significant
- Inconsistent information flow about projects
- Possible factors: info flow stops at local operator, sponsor may not provide, sponsor may receive "use it or lose it" funding, etc.

There is need/value for a clearinghouse to flag required engagement to stakeholders

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Observation #2: ALL projects suffer some level of coordination challenge

- Even largest and best coordinated projects have coordination problems/challenges
  - In planning and/or during construction
  - Upfront time to identify and involve right participants
  - Timely engagement and attention of required participants
  - Specifics of coordination dependent upon project, airport, etc.

Need consistent and repeatable engagement process that involves right stakeholders at right times

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Concept: "Scalable RTAP"

- **Similar to ACAC's safety-oriented checklist, there is a need for operations/efficiency oriented checklists**
- **Build upon RTAP experience and concept to scale RTAP in future based on the construction project**
  - Today, RTAP only for new runway but opportunity to take the knowledge and apply to many types of construction projects
  - Largest, most complex projects require the full gamut of checklist items in RTAP
  - Based on scale and complexity of the given project, some of checklist may not be relevant
  - May require a tool to help enable the process

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Many Open Questions

Scalable RTAP

- Who owns RTAP it today?
- What's in there now? What needs to be in a Scalable RTAP for different types of projects?
- What is lowest end project for which lowest end RTAP is applicable? What scale of project deemed "out" for lowest end RTAP?
- What is right team to own/manage? (Airport, ADO, Lead Carrier, Facility, Service Center, etc.?) What are the "control" or "enforcement" mechanisms?
- What is the mix of safety vs efficiency? What could/should be role of ACAC in context of a Scalable RTAP?
- How does or should this relate to existing guidance? What changes to existing guidance are required?
- Can define the best process, but what about resources to do the work?

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Many Open Questions

- **Clearinghouse**
  - Who owns it?
  - Is Tech Ops data a good source?
  - Are there other existing sources that could be tapped?
- **What is best way to segment construction projects?**
  - Timing? Complexity?
  - Required stakeholder engagement?
  - Size of Airport
  - Type of construction: move/new runway, rehab runway, etc.
  - Others TBD
  - What challenges from previous construction efforts help identify the right way to segment project types?

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Next Steps

- Complete Gap Identification
  - Stakeholder perspective/SME interview findings
  - Case Studies – including those that did not go well
  - Gaps across process – FAA focused
- Build out "Scalable RTAP" concept
  - Review RTAP process / ORD example
  - Review of existing checklists
    - ACAC Safety
    - Efficiency related (from EWR, LAX, JFK, etc.)

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Future Schedule

- Monthly meetings scheduled
  - August 24th
  - September 10th
  - October 8th
  - November 5th
  - December 10th
- Deliverable in Feb/Mar 2016

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Update from National Procedure Assessment Task Group

Michael Perrizo, Air Wisconsin

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Background

- FAA seeks to ensure effective transition from ground-based airways, routes and instrument flight procedures to use of satellite-based routes and procedures while still maintaining safety
- National Procedures Assessment (NPA) Initiative seeks to establish repeatable process and plan to cancel redundant or excess procedures and reduce maintenance costs
- Two processes or tracks used for publication of procedures and routes in our navigation structure:
  - 1) Regulatory, which includes airways, routes and instrument flight procedures (IFPs) that require rulemaking action before they are effective
  - 2) Non-regulatory, which include Standard Instrument Departures and Standard Terminal Arrivals (SIDs and STARs) and do not require rulemaking

Objectives of Task

- **Criteria for Procedure Cancelation**
  - For both regulatory and non-regulatory tracks
  - Validate or recommend changes to current approach
  - Explore opportunity to define one track
- **Implementation**
  - Validate or recommend changes to current plans
- **Outreach**
  - Validate or recommend changes to current plans
  - Particular attention to non-regulatory track
- **Recommend where to go next beyond current plan**

Task Group Members

- Marc Henegar, Air Line Pilots Association
- Darrell Pennington, Air Line Pilots Association
- **Michael Perrizo, Air Wisconsin (Co-Chair)**
- Michael Stromberg, Air Wisconsin
- Melissa Rudinger, Aircraft Owners and Pilots Association
- Brian Townsend, American Airlines, Inc.
- Steve Madero, DoD Policy Board on Federal Aviation
- Jose Alfonso, Federal Aviation Administration
- Robert Novia, Federal Aviation Administration
- Lee Brown, Landrum-Brown
- Dennis Kelly, National Air Traffic Controllers Association
- **Randy Burdette, State of Virginia Department of Aviation (Co-Chair)**
- Vernon Carter, State of Virginia Department of Aviation
- Bob Lamond Jr, National Business Aviation Association
- Trin Mitra, RTCA, Inc.
- Perry Clausen, Southwest Airlines
- Gary McMullin, Southwest Airlines
- John Brandt, The MITRE Corporation
- Glenn Morse, United Airlines, Inc.

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Process & Timeline

	Jun – Sep		Oct – Dec	Jan – Feb
General Approach	**Gather Background and Facts** (3-4 mtgs)	⇨	**Task Group Deliberation** (2-3 mtgs) ⇨	**Document Findings** (2-3 mtgs)
Criteria	**Current Focus** Background on Regulatory process • FSF 2011 Study • Additional criteria FR 2013 • Final criteria FR 2014 • Application criteria to NDBs • Feedback from NDBs Background on Non Regulatory process • Criteria developed within FAA • Application of criteria to ~100 SIDs and STARs		What are the gaps in current criteria? What new criteria would the TG offer? Is there any prioritization in criteria? Should there be one set of criteria for both regulatory and non-regulatory processes?	
Implementation	• How many procedure of different categories are there? • What are the current plans (scope, timing) for cancelation by each category?		Validate or recommend changes?	
Outreach	• What is current process for cancelation? What outreach is involved?		Validate or recommend changes?	
Where to go next	• None – a follow on to Implementation questions		Recommend where to go beyond current implementation plans	
Other Topics	• Airport ASSET Study • TBD – additional information as identified			

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Meeting Dates

- Kick Off Meeting Jun 26, 2015
- Meeting #2: Monday July 27th
- Meeting #3: Thursday August 27th
- Meeting #4: Thursday October 1st
- Meeting #5: Monday October 26th
- Meeting #6: Tuesday December 1st
- Meeting #7: Thursday January 7th
- Meeting #8: Thursday February 4th

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Next Meeting: July 27th

- Review Regulatory vs Non regulatory processes
  - Routine review process
  - Data on number of procedures in different categories
- Develop “exec sum” of criteria previously identified
- Review formal FAA implementation plan
- Review sample data – understand what is available as well as issues in the data for a cross section of case studies (a core 30, a regional, etc.)
  - Review PBN database, PDARS, any other sources

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DRAFT Terms of Reference

RTCA

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July 21, 2015

TERMS OF REFERENCE

National Procedure Assessment Task Group

Tactical Operations Committee

Committee Leadership:

Position	Name	Organization	Telephone	Email
Co-Chairs	Randy Burdette	Virginia Department of Aviation	804-236-3625	Randall.Burdette@doav.virginia.gov
	Michael Perrizo	Air Wisconsin	703-417-3006 (o) 202-765-8554 (c)	Michael.Perrizo@airwis.com
Subject Matter Experts	Jose Alfonso	Aeronautical Information Services, FAA	405-954-6378 (o) 405-593-7477 (c)	Jose.A.Alfonso@faa.gov
	Robert Novia	Airspace Services, FAA		Robert.Novia@faa.gov
Secretary	Trin Mitra	RTCA	202-487-3650	tmitra@rtca.org

Background:

The FAA seeks to ensure an effective transition from ground-based airways, routes and instrument flight procedures to greater availability and use of satellite-based routes and procedures while still maintaining safety. Building from past, smaller-scale efforts, the National Procedures Assessment (NPA) Initiative seeks to establish a repeatable process and plan to cancel redundant or excess procedures and reduce the maintenance costs associated with them.

Currently, there are two processes or tracks used for the publication of the procedures and routes in our navigation structure. Cancelation of procedures also follow these two track methods:

1) Regulatory, which includes airways, routes and instrument flight procedures (IFPs) that require rulemaking action before they are effective
2) Non-regulatory, which include Standard Instrument Departures and Standard Terminal Arrivals (SIDs and STARs) and do not require rulemaking

The FAA based the process in the NPA Initiative, which follows the regulatory track, on initial cancellation criteria received from the Flight Safety Foundation in 2011 and additional criteria solicited through public comment in the Federal Register in 2013/14. In June 2014, final criteria were published in the Federal Register. Using these final criteria, FAA focused on NDB and VOR procedures and identified over 700 for cancellation.

The non-regulatory track has also developed a process to review utilization data to identify both conventional and PBN candidate SIDs and STARs. Candidate procedures are further studied in the Service Center for facility input. The process does not include publication or comment via the Federal Register for public input. Existing collaborative projects like Metroplex projects are used to engage and coordinate with industry.

Deliverables:

The TOC is requested to provide a report addressing the following areas:

1) Review and validate the current NPA initiative assumptions and criteria developed to date for both the regulatory and non-regulatory tracks. If changes are recommended, please include the range of options/alternatives considered.
2) Review the proposed FAA implementation plans for both tracks and provide feedback and recommendations as needed.
3) Assess the effectiveness of the outreach planned and accomplished by FAA and make any recommendations needed for improvement.
4) Provide recommendations on what assumptions and criteria should be considered to advance the NPA Initiative beyond its current scope to encompass the remaining conventional and PBN routes and procedures. Please provide industry perspective on whether existing implementation plans and outreach would suffice for an expanded NPA Initiative. If there are barriers to getting to such recommendations, please describe them. Please provide recommendations on the priority of further future actions. In other words, what procedures should FAA look at next?

The TOC will complete this work by March 2016.

Scope:

The FAA's process for procedure cancelation has included the notion of Review, Refine and Remove procedures. This Task Group will focus on Review and Remove, but Refine is out of scope.

This effort aligns with a tactical effort by the FAA to remove procedures in the NAS. The Task Group's effort will support this one time objective of removal. In addition, the Task Group will consider and offer perspective on how to ensure the appropriate set of procedures in the NAS on an ongoing basis.

This task will focus on public use procedures.

Envisioned Use of Deliverables:

The TOC expects that the FAA will utilize the response to these questions to further mature the criteria, implementation, outreach and scope of the NPA Initiative.

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TOC Action

Consider for approval:

National Procedure Assessment Terms of Reference

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Class B Task Group: Designation, Design and Evaluation of Class B Airspace

Melissa McCaffrey, AOPA
Phil Santos, FedEx Express

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Background to Class B Airspace

- 1980's-90's: FAA established Terminal Control Areas (TCA), renamed to Class B, to address the risk of midair collisions between IFR and VFR aircraft
  - Added requirements on:
    - Controller separation standards, pilot qualification, and aircraft equipage
  - Airspace designation criteria and design parameters established for all airspace Classes (FAA JO 7400.2)

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Emerging Issues

Since criteria for Class B were developed, a number of changes in the NAS:

- Rise and fall of major airlines hub status for certain airports like STL, CVG and PIT
- Growth of business aviation, cargo and low cost operators, increasing use of secondary airports by high performance aircraft
- Increased utilization of the Global Positioning System (GPS) for navigation

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Opportunity Statement

- The FAA is considering updating the evaluation requirements to better identify when further action is needed
  - Is the appropriate metric being utilized during the evaluation process considering today's aviation landscape?
  - Are designation criteria and design requirements still applicable today?
  - When and how would Class B revoked and yet maintain the same level of safety under a different airspace classification?

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The Task Request

1. Class B airspace designation requirements.
2. Appropriate considerations for Class B airspace design criteria.
3. The evaluation process for airspace biennial reviews including criteria to expeditiously reduce or eliminate Class B airspace that no longer meets designation requirements.
4. Obtaining input from affected users as early in the process as possible.
5. Identifying the best mechanism(s) to communicate updated processes to key stakeholders.

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The Task Group

- Chris Baum, Air Line Pilots Association
- Marc Henegar, Air Line Pilots Association
- Darrell Pennington, Air Line Pilots Association
- Robert "Rip" Torn, Air Line Pilots Association
- **Melissa McCaffrey, Aircraft Owners and Pilots Association (Co-Chair)**
- Brian Townsend, American Airlines, Inc.
- Hazen Briggs, Federal Aviation Administration
- Dan Creedon, Federal Aviation Administration
- Gemechu Gelgelu, Federal Aviation Administration
- Gary Norek, Federal Aviation Administration
- Brenda Stallard, Federal Aviation Administration
- **Phil Santos, FedEx Express (Co-Chair)**
- John Allen, JetBlue Airways
- Joe Bertapelle, JetBlue Airways
- Chris Stephenson, National Air Traffic Controllers Association
- Kim Stevens, National Association of State Aviation Officials
- Keith Gordon, National Business Aviation Association
- Nat Iyengar, National Business Aviation Association
- Bob Lamond Jr, National Business Aviation Association
- Blanca Aguado, RTCA, Inc.
- Trin Mitra, RTCA, Inc.
- Thor Abrahamsen, The MITRE Corporation
- Debra Moch-Mooney, The MITRE Corporation
- Glenn Morse, United Airlines, Inc.
- CDR Joel Doane, US Department of Defense
- Bill Reabe, US Department of Defense

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Organization of Recommendations

- Designation of Class B
- Design of Class B
- Evaluation of Class B
- Public Engagement

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Designation of Class B: Key Observations

- Important to examine Class C designation criteria as well as Class B

Class B Designation	Text of Criterion
Enplanement	The primary airport serves at least 5 million passengers enplaned annually
Total Airport Operations	The primary airport has a total airport operations count of 300,000 (of which at least 240,000 are air carriers and air taxi)
Necessity of Class B Designation	The Class B designation will contribute to the efficiency and safety of operations, and is necessary to correct a current situation or problem that cannot be solved without a Class B designation.

Class C Designation	Text of Criterion
Primary Airport Operations	An annual instrument operations count of 75,000 at the primary airport
Primary and Secondary Airport Operations	An annual instrument operations count of 100,000 at the primary and secondary airports in the terminal area hub
Enplanement	An annual count of 250,000 enplaned passengers at the primary airport

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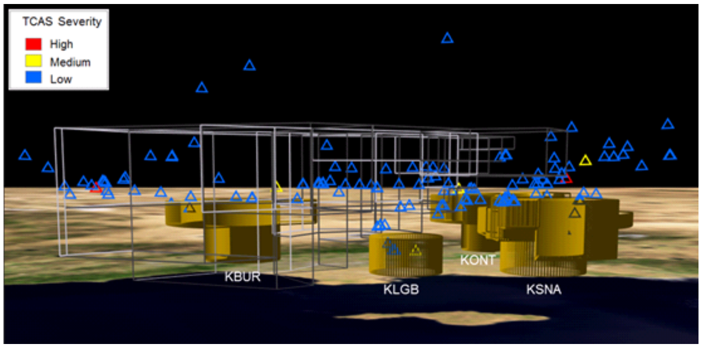
Designation of Class B Airspace: Key Observations

- Both Class B and Class C have been effective at avoiding midair collisions
- Conflict between IFR/VFR flights generally outside (but near the boundaries) of Class B/C airspace volumes



TED Tool Location of Calculated TCAS RA's in the Los Angeles Basin

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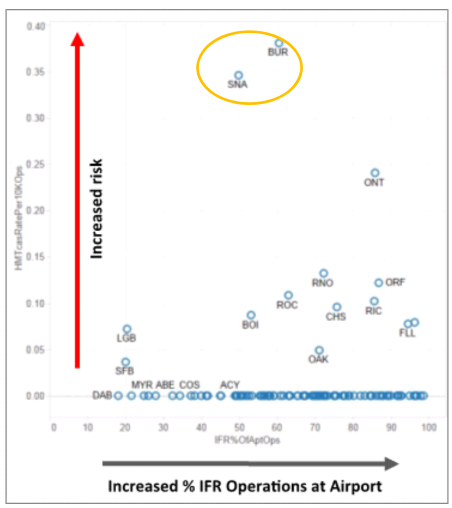
Designation of Class B Airspace: Recommendations (1 of 4)

- The FAA should remove the enplanement and air carrier/air taxi quantitative criteria



TED Tool Calculated TCAS RAs vs Percent of IFR Operations

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Designation of Class B Airspace: Recommendations (2 of 4)

- Total Airport Operations Counts should also include traffic from secondary airports and overflights
- An airspace complexity index should be developed to address airspace considerations beyond that of Total Airport Operations

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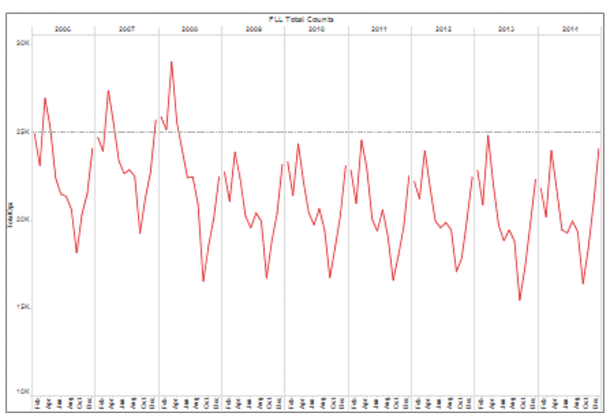
Designation of Class B Airspace: Recommendations (3 of 4)

- Criteria should be developed for airports with strong seasonal demand surges



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Designation of Class B Airspace: Recommendations (4 of 4)

- Use available safety data to more directly assess airspace complexity issues and mitigations
- Provide more guidance on how operational issues can be addressed without the Class B designation
- The FAA should periodically review Class B designation criteria to determine whether they should be adjusted

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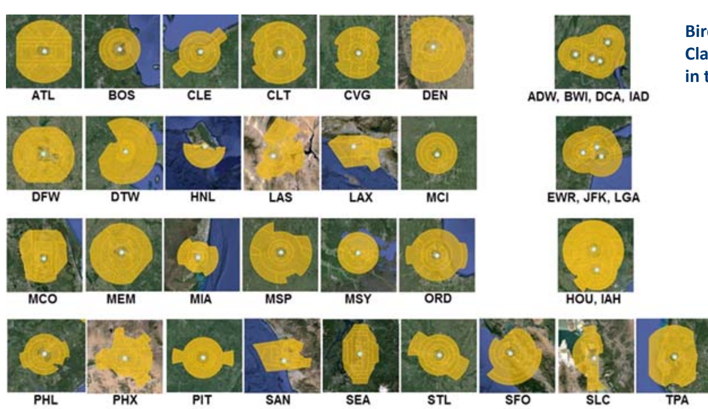
Design of Class B: Key Observations

- Mostly cylindrical designs today in the NAS with some notable exceptions



Bird's Eye View of Class B Airspaces in the NAS

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Design of Class B Airspace: Recommendations (1 of 4)

- Remove existing guidance indicating design should be centered on a NAVAID and amend guidance to ensure designers leverage the flexibility to configure airspace that maintains Class B safety standards
- Require a review of Class B airspace and instrument procedures whenever new runways are built, existing runway changes occur (e.g. decommissioned, lengthened, or shortened) or when procedures are developed or old ones canceled

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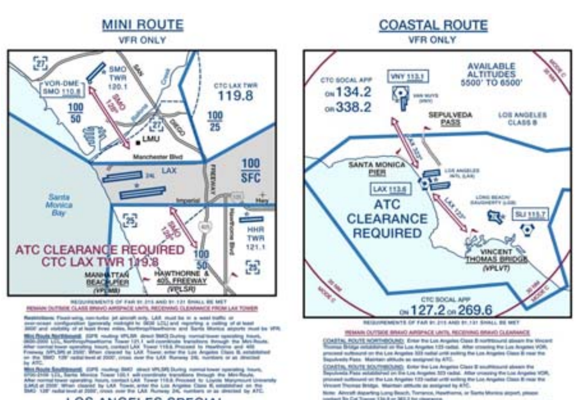
Design of Class B Airspace: Recommendations (2 of 4)

- Encourage designers to make maximum use of existing tools to accommodate VFR flights through or around Class B airspace



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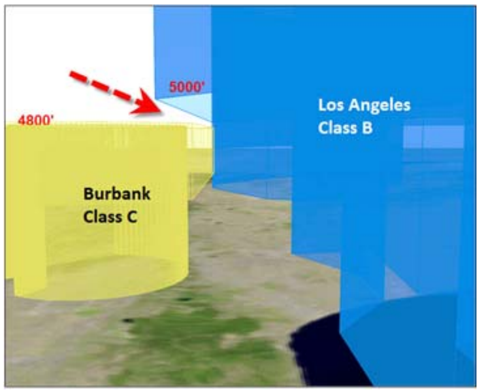
Design of Class B Airspace: Recommendations (3 of 4)

- Evaluate lateral and vertical gaps between adjacent airspace where VFR flight has the potential to increase hazards for Class B or Class C operations



Gap between Burbank Class C and Los Angeles Class B

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Design of Class B Airspace: Recommendations (4 of 4)

- Recommend introduction of an altitude buffer between protected IFR airplanes and VFR aircraft

- Ensure all Class B Terminal Area Charts include information on IFR arrival/departure routes to/from the primary airport and explore possibility of extending to include secondary airports

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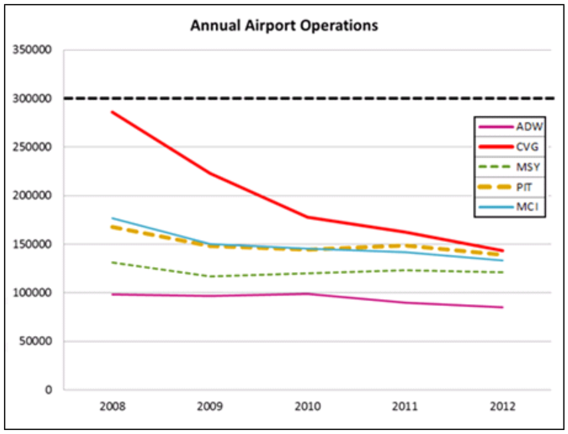
Evaluation of Class B: Key Observations

- Multiple Class B airports fall below 50% of the required annual airport operations



Annual Operations for Selected Airports with Class B Airspace

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Evaluation of Class B Airspace: Recommendations

- Update FAA Order 7400.2 with additional guidance on data sources relevant for the biennial review
- Develop criteria for identifying when Class B airspace should be revoked

Criteria should include:
- A Threshold for when such an action should be considered.
- Guidance on how long the condition must exist before action is initiated.
- Guidance on taking into account forecast information

- Outline a process for revoking Class B airspace

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Public Engagement: Recommendations

- Conduct further public engagement before implementation of any design, designation and evaluation changes to Class B guidance

Recommended Process for Implementation of Updated Class B Guidance

- Whether communicating draft language or a Final Rule of changes to the Class B guidance, the group recommends the FAA utilize one centralized and consistent package of information across all public engagements

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Class B Airspace: Designation, Design and Evaluation

DISCUSSION

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TOC Action

Consider Recommendation on:

Class B Airspace: Designation, Design and Evaluation

Transmit to FAA and
Sunset the Class B Task Group

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Anticipated Issues for Next Meeting

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Time Based Flow Management (TBFM)

- TBFM has been ongoing industry concern
- Breaking down concern, issues include:
  - Requirements
  - Integration
  - Metrics
- Potential for TBFM tasking to TOC
  - Question of what fits in TOC vs CDM
  - Meeting week of August 24th between FAA and Industry to discuss further

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Closing Comments

Designated Federal Official:

Lynn Ray, Federal Aviation Administration

Co-Chairs:

Jim Bowman, FedEx Express

106

Next Meetings:

November 12, 2015

March 2016

Washington, DC

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Adjournment

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RTCA Paper No. 186-15/TOC-21

May 20, 2015

Meeting Summary, May 20, 2015

Tactical Operations Committee (TOC)

The ninth meeting of the Tactical Operations Committee (TOC), held on February 5, 2015, convened at 11:00 a.m. The meeting discussions are summarized below. The following attachments are referenced:

Attachment 1 – List of Attendees
Attachment 2 – Presentations for the Committee (containing detailed content of the meeting)
Attachment 3 – Summary of the February 5, 2015 TOC Meeting
Attachment 4 – FAA Response to TOC Recommendations on VOR MON Waterfall Schedule
Attachment 5 – Modification to the GPS Adjacent Band Compatibility Task Group Terms of Reference
Attachment 6 – Terms of Reference for Airport Construction Task Group

Welcome and Introductions

Committee Co-Chairs, Mr. Jim Bowman, Vice President of Flight Operations at FedEx Express, and Mr. Dale Wright, Director of Safety and Technology at NATCA, called the meeting to order and welcomed the TOC members and others in attendance. All TOC members and attendees from the public were asked to introduce themselves (TOC members and General Public Attendees are identified in Attachment 1).

Mr. Bowman and Mr. Wright reviewed the agenda and began the proceedings of the meeting.

Designated Federal Official Statement

Ms. Elizabeth "Lynn" Ray, Vice President of Mission Support for the Air Traffic Organization (ATO), and the Designated Federal Official of the TOC, read the Federal Advisory Committee Act notice governing the open meeting.

Approval of February 5, 2015 Meeting Summary

The Chairs asked for and received approval of the written Summary for the February 5, 2015 meeting (Attachment 3).

Briefing on the National Special Activity Airspace Program (NSAAP)

Mr. Rob Hunt, Manager of the Technical Analysis and Operational Requirements Group (AJV-73), provided an overview briefing to the TOC on the National Special Activity Airspace Program (NSAAP). (Briefing charts are included in Attachment 2.) Mr. Hunt reviewed the overall approach of NSAAP, what has been completed to date and planned future development and timing.

There were comments from multiple TOC members regarding the schedule for NSAAP. Some Committee members had interest in when dynamic information in NSAAP would be available. There was discussion that NSAAP is a "win-win" for industry and the FAA and if there were any opportunities to move the schedule forward, they should be pursued. The last investment milestone, which relates to dynamic information in NSAAP, is currently planned for 2019, implying that the capability would be available in the 2020/2021 timeframe. Some operators expressed disappointment with the planned timing.

Mr. Hunt informed the TOC that the FAA recognized the benefits and priority for NSAAP. However, he reminded the group that budgets were limited and NSAAP was competing against many other priorities for financial and human resources. Finally, a TOC member inquired if there were any studies on the end-state benefits of NSAAP available for review. Mr. Hunt noted that MITRE had done a study and that he would investigate what was available to share with the Committee.

FAA Response to VOR MON

Mr. Dale Courtney, FAA's National Resource Engineer for Navigation, presented the FAA's response to the VOR MON Recommendation on the Waterfall Schedule. The FAA's response letter is included as Attachment 4. Mr. Courtney noted that the FAA currently had a list of 308 VORs slated for decommissioning but that the order was not yet final. He stated that the relationship of these VORs to procedures was a key factor. Mr. Courtney also indicated that the FAA planned to publish a notice in the Federal Register for the first 100 VORs shortly.

Mr. Courtney expressed thanks and agreement with the TOC's recommendations on the VOR MON Waterfall. Ms. Ray echoed those thanks to the task team that worked on the recommendations.

Discussion on GPS ABC Tasking

Mr. Bruce DeCleene, Manager, Flight Technologies and Procedures Division, next briefed the TOC with respect to the GPS Adjacent Band Compatibility tasking. He informed the TOC that the Federal Government has concern with how to best utilize the spectrum adjacent to GPS. He noted that the FAA was interested in whether the proposed cylindrical Exclusion Zones around transmitters radiating on spectrum adjacent to GPS would have any safety or operational impact in the National Airspace System. Mr. DeCleene also requested the TOC to ask, if the zones as proposed were not acceptable, what would be. Finally, he pointed out that this effort within the FAA was a general effort in consideration of use of spectrum adjacent to GPS and it was not a task specific to any specific proposed use of the adjacent band.

One TOC member noted during the discussion that operational scenarios that depict the impact of the proposed Exclusion Zones would be critical to evaluating their safety and operational impacts.

The GPS ABC Task Group proposed a slight modification to the language of the originally approved Terms of Reference, noting that the group was to examine only the Exclusion Zones proposed in the FAA's original study. The TOC approved these modified TORs. (This is included as Attachment 5)

Airport Construction

Mr. Chris Oswald, Airports Council International-North America, gave a brief presentation to the TOC about the approach the Airport Construction Task Group was pursuing with respect to its tasking. He informed the TOC that the Task Group was currently in a stage of data gathering and foundation building through evaluating construction case studies and gathering information on current tools and processes. Mr. Oswald noted that later in the year the group would deliberate based on this data to answer questions such as what the construction process should be and what additional tools or data are required. Mr. Oswald proposed Terms of Reference for the Airport Construction Task Group and these were approved by the TOC. (This is included as Attachment 6.)

Status of Ongoing Tasks

Next, Mr. Trin Mitra, RTCA, gave a brief overview of other existing tasks for the TOC. Mr. Mitra informed the TOC that the National Procedure Assessment Task Group had formed and that its first meeting was scheduled in June 2015. He also told the TOC members that three other groups were on target for delivering recommendations at the next TOC meeting on July 21st: the Class B Task Group, the Eastern Regional Task Group (on Caribbean operations) and the NOTAM Task Group.

Adjourn

Chairman Wright ended the meeting of the Committee at 12:30 p.m.

Next Meeting

The next meeting of the TOC is July 21, 2015 in Washington, DC.

Air Traffic Organization Position Chart

(*As of July 21, 2015*)

Chief Operating Officer

Deputy Chief Operating Officer

Management Services Vice President (A)

- *Deputy VP (A)*
- *Director Labor Employee Development (A)*
- *Director Community Enterprise (A)*
- *Director Resource Enterprise (A)*

Safety & Technical Training Vice President

- *Deputy VP (A)*
- Director Safety
- *Director Technical Training (A)*
- Director Policy & Performance

Program Management Organization Vice President

- *Deputy VP (V)*
- Director Systems Integration & Req Analysis
- Director Air Traffic Systems
- Director Enterprise Services

System Operations Vice President (A)

- *Deputy VP (A)*
- Director Systems Operations
- Director System Operations Security
- Director Flight Services
- Director Data Management
- *Director Surface Operations (V)*
- Director ATO International
- Director Performance Analysis

Air Traffic Services (ATS) Vice President

- Deputy VP
- Director Operations HQ
- Director ATS Ops Central Area-N
- *Director ATS Ops Central Area-S (A)*
- Director ATS Ops Eastern Area -N
- Director ATS Ops Eastern Area -S
- Director ATS Ops Western Area -N
- Director ATS Ops Western Area -S

Mission Support Services Vice President

- Deputy VP
- Director Airspace Services
- Director Aeronautical Information Services
- Director ATO Ops Concepts, Validation & Req
- Director Air Traffic Procedures
- Director Central Service Center
- Director Eastern Service Center
- Director Western Service Center

Technical Operations Vice President

- *Deputy VP (A)*
- Director Operations Support
- *Director ATC Facilities (A)*
- Director Flight Inspection Services
- Director National Enterprise Operations
- *Director Technical Ops Central Service Area (A)*
- Director Technical Ops Eastern Service Area
- Director Technical Ops Western Service Area

Approved by the Tactical Operations Committee July 2015

Review of NOTAM Search Phase 2 Implementation

Report of the Tactical Operations Committee in Response to Tasking from The Federal Aviation Administration

July 2015

Review of NOTAM Search Phase 2 Implementation

Contents

Background/Introduction

The Federal Aviation Administration (FAA) is required under Section 3(c) of Public Law 112-153, also known as the 2012 Pilot's Bill of Rights ("PBoR"), to "establish a NOTAM Improvement Panel, which shall be comprised of representatives of relevant nonprofit and not-for-profit general aviation pilot groups, to advise the Administrator in carrying out the goals of the NOTAM Improvement Program." The FAA would like to build on the progress already derived from previously established efforts to digitize NOTAMs to comply with the provisions of this law.[1]

The Tactical Operations Committee (TOC) serves as the NOTAM Improvement Panel to further assist the Administration in crafting specific goals and priorities to meet the law's intent and make needed enhancements to the NOTAM program. In this capacity, the TOC is relying on the NOTAM Task Group (TG) to provide specific recommendations on issues related to the NOTAM program.

The work of the panel will yield an increasing amount of standardized digital NOTAMs that can be more easily filtered, sorted, and prioritized. This should result in a significant reduction in the volume of NOTAMs pilots must currently review and allow pilots to focus only on those NOTAMs relevant to their flight plan/path. As a result, pilots will be more confident in the quality and accuracy of this focused NOTAM information, and the safety of the National Airspace System (NAS) will be improved.

The panel is currently in process of providing feedback to the FAA on the implementation of the NOTAM Search website.

Task and Approach

In previous FAA responses to NOTAM Improvement Panel recommendations, the FAA requested "working meeting[s] between the members of the Task Group and the Federal NOTAM System (FNS) engineering and development teams to define stakeholder requrements for some of the specific requests." The Task Group Leadership engaged directly with the FNS team previously and provided clarification of search and filter terms, prioritization of search and filter options and other specific inputs. Much of the input of the NOTAM Task Group formed the NOTAM Search implementation plan for the FAA.

Building upon these interactions, the FAA requested the NOTAM Improvement Panel continue to provide feedback to the FAA after NOTAM Search implementation. The FAA crafted a four phase plan and the NOTAM Task Group agreed to provide feedback after each phase of implementation.

The NOTAM Task Group evaluated the NOTAM Search Phase 2 implementation during May 2015 and compiled feedback. The summary of that feedback forms the body of this recommendation document.

[1] Letter from Elizabeth L. Ray (Vice President, Mission Support Services) to Margaret Jenny (RTCA President) dated July 10, 2013.

Feedback on NOTAM Search Phase 2 Implementation

The following items are new recommendations the NOTAM Task Group identified in its review of the second phase of NOTAM Search:

Training Videos

The Task Group commended the FAA for its rapid development of training videos. The group suggested that narration in the videos would provide a significant improvement in the utility of the videos. The group recommended the FAA add audio to the videos in a future phase of deployment so long as no other elements of the implementation are displaced.

Selection of ARTCC NOTAMs or TFR NOTAMs

In a Flight Path search, the user can select ARTCC NOTAMs or TFR NOTAMs but not both. Based on feedback from the Phase 1 implementation, the FAA is already working on clarifying to the user that ARTCC is a superset of NOTAMs and TFR is a subset. The Task Group continues to support clarification of this through appropriate labeling and updating of the Graphical User Interface. The Task Group also recommends the FAA consider including a training video that clarifies the superset/subset structure of ARTCC/TFR NOTAMs.

Search by Accountability

The Task Group noted that the option to search by "Accountability" is a lesser known categorization to the user community and not currently documented on NOTAM Search. The group recommends the FAA provide clarification and definition of this category in a future enhancement of the User Guide.

Communicating Planned Enhancements

The Task Group recommended the FAA include a list of planned future enhancements directly on the NOTAM Search webpage. This could be in the form of a PDF document of enhancements that changes with each Phased release of NOTAM Search.

Next Steps

The next scheduled releases for NOTAM Search are June 25, 2015 and September 24, 2015. The third phase focuses on User Profile and Filter Enhancements. The fourth phase focuses on ensuring all Pilot Web functionality is replicated in NOTAM Search to allow the sunsetting of PilotWeb. The NOTAM Task Group plans to schedule a meeting with the AIM office in the October 2015 to review Phases 3a and 4 in preparation for a submission to the Tactical Operations Committee at the November 2015 meeting.

Appendix A: Members of the NOTAM Task Group

Darrell Pennington, Air Line Pilots Association
Tom Kramer, Aircraft Owners and Pilots Association
Des Keany, American Airlines, Inc.
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THE GOLD STANDARD FOR AVIATION SINCE 1935

Approved by the Tactical Operations Committee July 2015

Recommendations to Improve Operations in the Caribbean

A Report of the Tactical Committee in Response to Tasking from The Federal Aviation Administration

July 2015

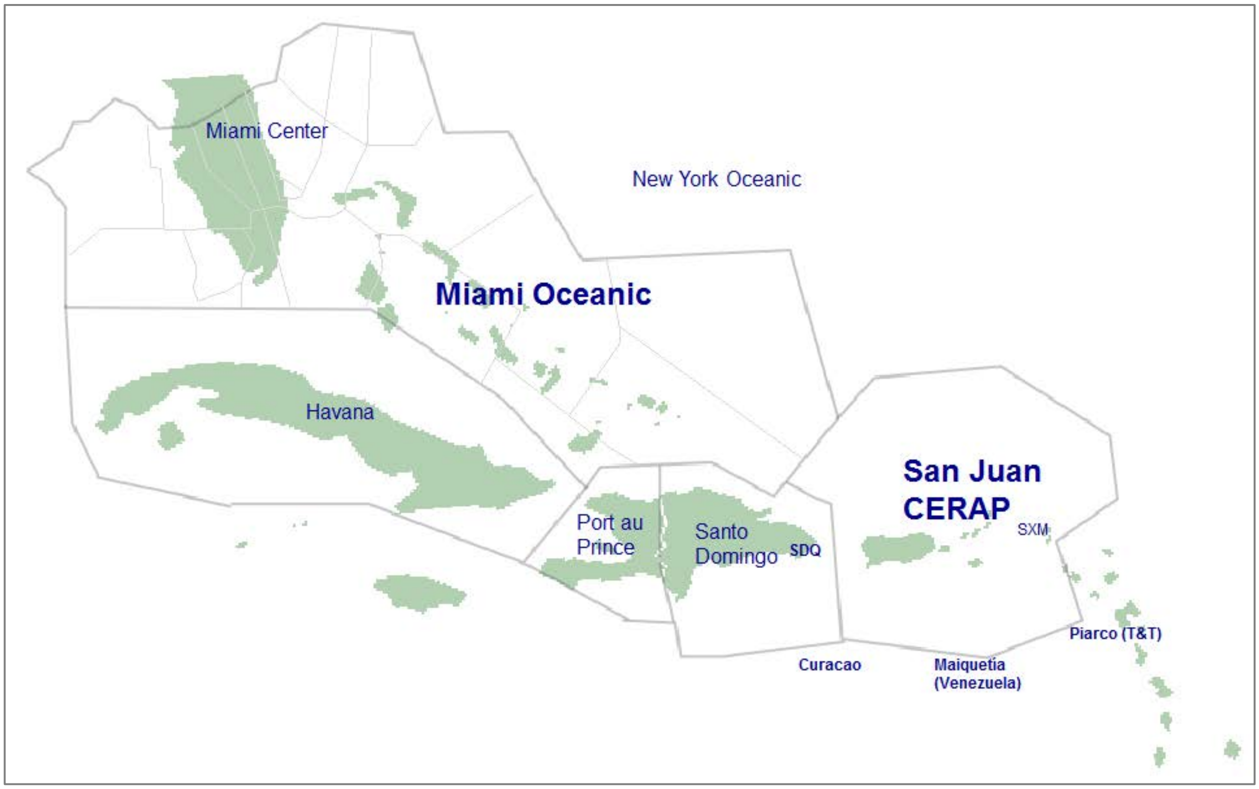
Recommendations to Improve Operations in the Caribbean

Contents

Background and Introduction

In recent years, stakeholders involved with managing and operating air traffic between the United States and the Caribbean have identified a need to address airspace capacity, operational performance and safety in the region. Within the National Airspace System (NAS), the Federal Aviation Administration (FAA) Caribbean region is defined as the combination of Miami Air Route Traffic Control Center (ARTCC) airspace over water (ZMA Oceanic[1]) and the San Juan Combined En Route Approach Control Facility (CERAP or ZSU). The diagram below highlights ZMA Oceanic and ZSU airspace:

Figure 1 Caribbean Airspace



In September of 2014, the Eastern Regional Task Group (ERTG) of the RTCA Tactical Operations Committee (TOC) met with FAA operational personnel from the Caribbean region to document existing issues and review historical trends. Both FAA and industry personnel agreed that there are infrastructure and airspace issues in the region that need to be addressed to improve operations and safety. This premise is further supported by National Transportation Safety Board (NTSB) observations and recommendations issued in August 2012 in response to a safety incident in ZMA Oceanic in July 2012.

The FAA considered the issues raised by the ERTG and made a task request to the TOC to offer recommendations to improve Air Traffic Control (ATC) services and performance in the region. The

[1] This report refers to ZMA "Oceanic," IAW ICAO doc 7030 CAR region, to describe the non-domestic airspace over the ocean. Surveillance capabilities and direct pilot controller radio communication allow the application of domestic separation standards.

Tasking Letter states: "We [the FAA] believe a tasking to the TOC to provide recommendations on a comprehensive approach to address infrastructure and airspace changes in the region would benefit the NAS as a whole. We request the TOC provide recommendations on a comprehensive strategy for infrastructure and airspace changes to improve safety, efficiency and capacity in the region. Specifically, this tasking would include recommendations in the following sub-task areas":

- **Problem Identification**: the use of data to clearly define the problem, causes and solutions to the safety, efficiency and capacity issues in the region.
- **Infrastructure**: prioritized solutions for any infrastructure components identified as most critical to improving/enhancing operations in the region.
- **Airspace**: prioritized solutions for any airspace improvements or enhancements as needed.
- **Harmonization**: a review of existing or planned domestic or international activities in the region and a recommended method or mechanism to insure all the work is harmonized into a comprehensive and coherent master plan.

The TOC requested the Eastern Regional Task Group to provide a response to this task request from the FAA. The report that follows presents the recommendations of the TOC and ERTG in response to the questions posed by the FAA in its tasking letter.

Executive Summary

In November 2014 the Federal Aviation Administration (FAA) tasked the RTCA Tactical Operations Committee (TOC) Eastern Region Task Group (ERTG) with identifying infrastructure and airspace issues that need to be addressed to improve the safety, capacity and efficiency of operations in the Caribbean. The FAA acknowledged in its tasking letter that airspace in the region has remained largely unchanged for many years despite the growth of air traffic in the region. Though small improvements have been made to existing infrastructure and procedures, a demand-capacity imbalance continues to exist, particularly during peak seasonal periods. Demand in the region is expected to continue growing and absent significant improvements to infrastructure and airspace, delays are expected to escalate, adversely impacting the traveling public and operators in the region.

The ERTG, which consists of representatives of the airlines, business aviation, pilots, air traffic controllers and the DoD, along with subject matter experts from the FAA, held monthly meetings during the first half of 2015 to understand operations in the region. Based on this, and in direct response to the FAA tasking, the group developed a comprehensive set of infrastructure and airspace priorities that will improve the safety, capacity and efficiency of the Caribbean airspace.

A unique feature of ZMA's Oceanic airspace is the funnel design which is created by multiple foreign Air Navigation Service Providers (ANSPs) bordering it to the south and New York's Oceanic airspace to the north. In recent years, growing traffic volumes have been compressed through this funnel constraining throughput in the area. Additionally, between these disparate adjacent airspaces including those underlying ZMA Oceanic, multiple separation standards exist due to variations in surveillance, communication and automation, and more specifically, a lack of connectivity in each of these domains.

These infrastructure limitations result in increased complexity and the requirement to manage throughput in order to ensure the safe and orderly flow of traffic in the region.

Infrastructure options for the region were considered, prioritized and organized into four areas: Communications, Surveillance, Automation and Technology Improvements. After detailed study, it became evident that each of these areas must be addressed collectively in order to best achieve the desired outcomes. The group examined a broad range of issues including radar coverage and overlap, frequency reliability and redundancy for air to ground communications, limited or non-existent instant communications capability with adjacent ANSPs, etc. Existing communication gaps between controller and aircraft were highlighted as a priority to ensure safe management of aircraft. The group also noted a lack of automated data exchange for flight plans and boundary crossing estimates with multiple neighboring foreign facilities as a significant issue limiting capacity. This lack of automation requires extensive manual coordination involving a three or four person sector teams when normally it would take two. Additionally, many inter-facility communications and data exchanges still require use of dial-up telephone to coordinate and copy flight plans and transfer control. During periods of moderate to heavy demand, these rudimentary capabilities are an impediment to the flow of traffic and frequently require traffic management initiatives of varying magnitudes to spread out the demand. During the approximately 120 days of the peak Caribbean season in FY2015, there were 20 days with Airspace Flow Programs and 50 days with miles or minutes of trail between facilities in the Caribbean. Scheduled or unscheduled equipment outages can exacerbate the problems.

As noted above, airspace design and route structure in the Caribbean have remained unchanged in the face of increasing demand. Demand, particularly on a seasonal basis, is expected to continue to grow and will be augmented by the relaxation of travel restrictions to Cuba. The Group looked broadly at the region for opportunities to redesign airspace in both ZMA Oceanic as well as ZSU. In ZMA, Sector 40 is highly complex as this sector manages the intersection of arrival and departures to multiple airports as well as overflights. The NTSB has previously offered observations for improving Sector 40. ZMA Oceanic, unlike other Oceanic Centers, manages aircraft utilizing standard radar separation. Given these sectors are much longer than their domestic counterparts, the amount of traffic a controller has to manage can be significant. At ZSU, there have been minimal changes to the airspace or sector design since the closure of a Navy base and decommissioning of its associated Warning Area. Airspace capacity can be increased and associated TMIs reduced by jointly redesigning the airspace in ZMA and ZSU and ensuring connectivity to routes being developed by the South Florida Metroplex project team and neighboring ANSPs. This may require creation of additional physical sectors, particularly in ZMA.

A key recommendation that supports the need for better and expanded surveillance coverage in the region is to install additional ADS-B ground stations to increase surveillance coverage in the region and "make the airspace funnel wider" thus increasing routes with radar separation standards in and out of the Caribbean. It would also provide much needed surveillance redundancy that affords operational advantages to appropriately equipped aircraft in the event legacy radar surveillance is out of service, similar to the operational capabilities being developed in New York Center for the offshore radar routes. Currently, ZMA domestic and ZSU each have ADS-B ground stations, however there is a broad expanse of airspace in the corridor between them where ADS-B is unavailable and where existing surveillance sources have reliability issues.

A related recommendation is increased sharing of radar data with other ANSPs to facilitate reduced separation requirements between adjacent facilities when airport infrastructure and other flow constraints permit. In addition, the TG supports short cut opportunities identified by the FAA in the Caribbean that can be implemented fairly expeditiously.

There is a compelling need for enhanced enroute weather data for controllers to increase the safety and efficiency of the extended overwater operations and the TG is making a strong recommendation to accelerate the availability of a prototype weather information system, Offshore Precipitation Capability, (OPC), for ZMA and ZSU to cover the areas beyond the range of the existing ground based weather radar systems.

It is challenging to provide a “comprehensive approach or strategy” for improvements in the Caribbean region with the seemingly disparate needs and diverse population of ANSPs and airspace. Over time, the FAA has identified a portfolio of projects to improve safety and capacity in the region that have reached various levels of maturity, but have generally lacked funding in the constrained budget environment. In many cases, the projects require international negotiation and agreements. For infrastructure priorities, recommendations in this report are based, where possible, on impact to the highest number of operations. As the needs of the region are addressed, care must be taken to ensure new capacity imbalances or constraints are not introduced and, further, that redundant capabilities are established to accommodate equipment outages or other irregularities.

Finally, many organizations in the FAA and industry collaborated to develop these recommendations. The diversity of the recommendations and the requirement to negotiate agreements with foreign governments underscore the fact that an FAA team spanning multiple lines of business will need to work together to build the ultimate plan for implementation. The leadership of this implementation will need to maintain active coordination within the FAA, industry and internationally to ensure harmonization with other airspace and capacity improvement initiatives in the region (ICAO Aviation System Block Upgrades, PBN) and to prioritize these recommendations for the Caribbean.

The table below provides a summary of the recommendations discussed in more detail throughout this report:

Executive Summary of Prioritized Recommendations

<table>
<tr><th colspan="2">Category</th><th>Prioritized Recommendations</th></tr>
<tr><td rowspan="12">Infrastructure Priorities</td><td rowspan="3">Communications</td><td>Implement a New Communications Frequency at Saint Maarten</td></tr>
<tr><td>Implement a New Communications Frequency at Abaco Island</td></tr>
<tr><td>Install Dedicated Shout Lines with Certain Adjacent or Underlying International Facilities</td></tr>
<tr><td rowspan="2">Automation</td><td>Regional Implementation of Automation:
1. Continue implementation of ADE with Santo Domingo
2. Develop software translation for neighboring facilities with AIDC protocol
3. Ensure ERAM software upgrades associated with ADE stay on schedule</td></tr>
<tr><td>Implement Independent Flight Data Processing in ZSU</td></tr>
<tr><td rowspan="3">Surveillance</td><td>Implement ADS-B in the Caribbean</td></tr>
<tr><td>Input St. Maarten Radar into the ZSU Radar Mosaic System</td></tr>
<tr><td>Identify and Access a Backup Option for Grand Turk Radar</td></tr>
<tr><td rowspan="4">Technology Improvements</td><td>Investigate Option to Access Weather Information from Long Range DoD/DHS Radars</td></tr>
<tr><td>If the Offshore Precipitation Capability (OPC) shows promise, expedite Caribbean access</td></tr>
<tr><td>Enable ZSU to Participate in Data Comm</td></tr>
<tr><td>Make Caribbean Radar Presentations Available to ZNY</td></tr>
<tr><td colspan="2" rowspan="5">Airspace Priorities</td><td>Explore Options to Reduce Separation between ZNY and ZSU/ZMA</td></tr>
<tr><td>Implement a Shortcut Route between CARPX and RENAH</td></tr>
<tr><td>Conduct an Integrated Redesign of ZMA and ZSU Airspace</td></tr>
<tr><td>Improve Short Term Cuba Access in the Giron Corridor</td></tr>
<tr><td>Prepare for Significant Growth in Cuba Operations</td></tr>
<tr><td colspan="2" rowspan="3">Harmonization</td><td>FAA should establish one body to develop an integrated plan and lead implementation in the Caribbean</td></tr>
<tr><td>Maintain Active Coordination with ICAO's North America, Central America and Caribbean Offices</td></tr>
<tr><td>Ensure Active Involvement of the Office of International Affairs, Western Hemisphere Office</td></tr>
</table>

Methodology

The Eastern Regional Task Group held a series of meetings and teleconferences between January and June 2015 to deliberate on elements of the Caribbean task request. As the ERTG learned about the complexities and challenges of the safe and efficient movement of air traffic in the region, the FAA made appropriate Subject Matter Experts (SMEs) available to help the group understand the needs and realities more effectively. By the time recommendations were developed, the group included representatives from the following organizations (in alphabetical order):

- Air Line Pilots Association (ALPA)
- Department of Defense (DoD)
- FAA Air Traffic International Office, Americas Group
- FAA Eastern Service Center – Planning and Requirements Group (PRG) and Operations Support Group (OSG)
- FAA Management and NATCA personnel from impacted NAS facilities – New York Air Route Traffic Control Center (ZNY), Miami Air Route Traffic Control Center (ZMA) and San Juan Combined Center/Radar Approach Control (ZSU)
- FAA Manager of Tactical Operations (MTO) for the Southeast
- FAA Oceanic and Offshore Standards and Procedures Group
- FAA Office of International Affairs, Western Hemisphere Office
- FAA Surveillance and Broadcast Systems (SBS) Office
- International Air Transport Association (IATA)
- Major scheduled and cargo air carriers in the region
- National Air Traffic Controllers Association (NATCA)
- National Business Aviation Association (NBAA)

The ERTG's process was to request the FAA ATC facilities in the region to provide briefings on their operations and to identify their most pressing operational needs first. This involved discussions and briefings with Management and NATCA representatives from ZMA and ZSU, the primary enroute and terminal facilities responsible for air traffic services in the region. After identifying the operational needs with the facilities, the ERTG worked with flight operators and facilities to understand the operational and safety benefits of each operational capability or program. Additionally, the group worked with the Eastern Service Center PRG and OSG and the Air Traffic International Office, Americas Group personnel to fully understand the status and implementation realities of each requirement, including cost, equipment required, international agreements, etc.

After gathering the full background on each capability or project, the group went through a consensus-based exercise to prioritize the needs based on expected safety and capacity benefits and flights impacted. The results were then complied and translated into the recommendations in this final report.

Problem Identification

Robust Growth of Demand in ZMA Oceanic and ZSU

Operations through the FAA's Caribbean region, defined as ZMA Oceanic and ZSU airspace, has had robust growth over the last five years. Data presented below demonstrate that the combined number of aircraft handled by the ZMA Oceanic and ZSU has been growing since FY2009. Note in the second chart that this growth outpaces the growth in the entire National Airspace System (NAS). Growth has occurred in this region in an environment in which "in 2014, activity at FAA facilities declined for the seventh consecutive year."[2]

Figure 2 Growth of ZMA/ZSU Traffic

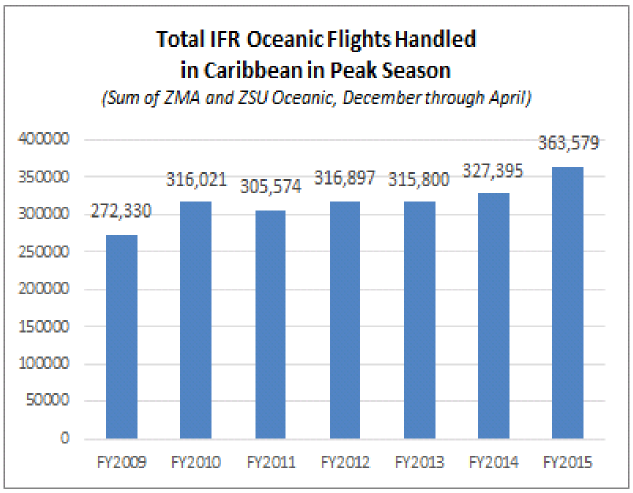
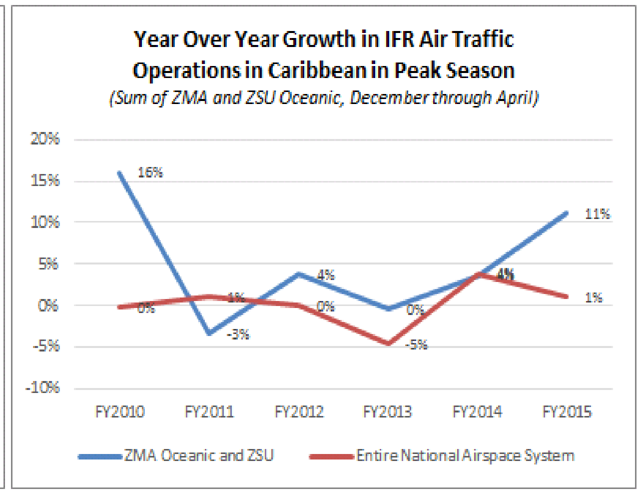


Figure 3 Comparison of ZMA/ZSU Growth to Rest of the NAS



Source: OPSENT data, Aviation System Performance Metrics (ASPM)

There are a number of different factors that may contribute to the growth of traffic in the Caribbean region and ultimately traffic through ZMA and ZSU airspace. This includes economic growth in the Caribbean, Central and South America, cruise ship activity and tourism, and Miami evolving into a financial hub for Latin America ("The Wall Street of the South").

Looking forward, both scheduled and non-scheduled operations are expected to grow in and around the region. The International Air Transport Association expects passenger growth in Latin America and the Caribbean to grow from the current level of 242 million to 385 million within 10 years, assuming certain infrastructure and other improvements by regional governments. This growth will be accelerated by the recent opening of relations between the United States and Cuba and an easing of travel restrictions[3]. Already, at least one US operator has announced scheduled charter service between New York and Havana beginning in July 2015[4]. Additionally, while FAA analysis of ARTCC activity projects an overall 4% decrease of operations in the NAS in 2019, the only Center projected to increase activity is ZMA which is estimated to grow by 1.3% by 2019. This data is drawn from the FAA's Performance Analysis Group's Five Year Projection (FYRP). The FYRP forecasts future traffic based primarily on the dynamics of

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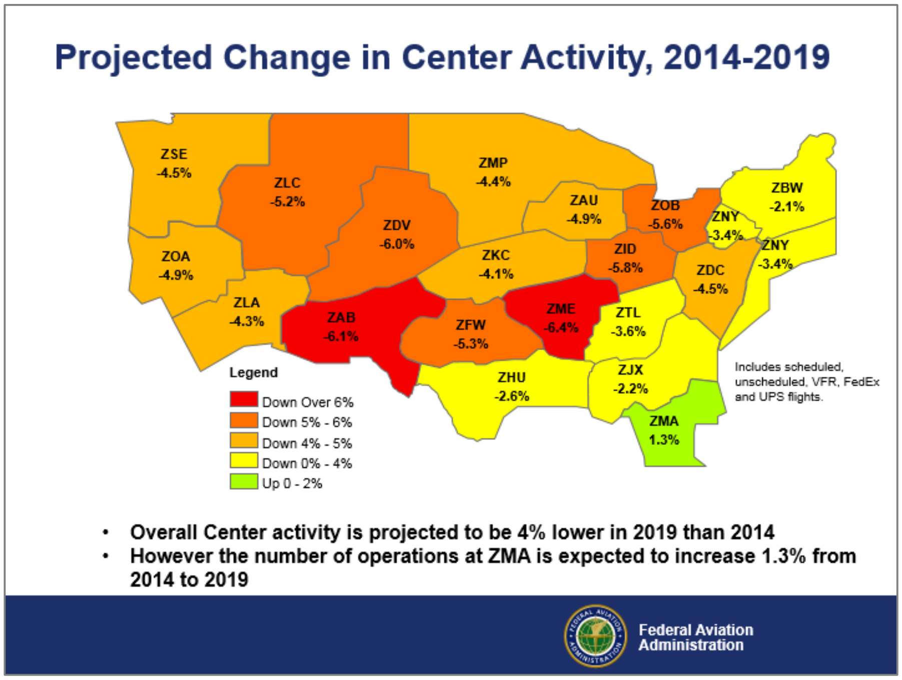
[2] Source: "FAA Aerospace Forecast, Fiscal Years 2015 – 2035"
[3] See: http://www.nytimes.com/2015/01/16/world/americas/us-eases-decades-old-rules-on-travel-to-cuba.html
[4] See: http://otp.investis.com/clients/us/jetblue_airways/usn/usnews-story.aspx?cid=981&newsid=29204

scheduled US carriers along with more generalized assumptions about traffic for foreign carriers, general aviation and cargo operations[5]:

Figure 4 FAA Projected Growth of Center Activity in the NAS: 2014-2019



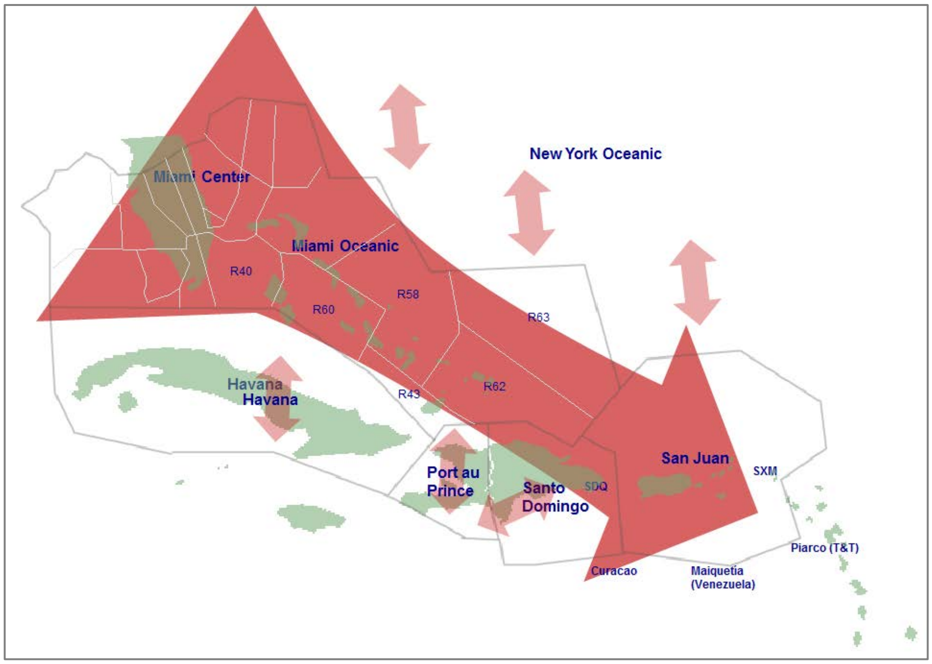
Source: FAA AJR-G Five Year Projection (FYRP) for the NAS

Funnel Effect of Caribbean Traffic

The primary operational challenge for the NAS Caribbean region is the funneling of traffic between ZMA and ZSU within a combination of radar and non-radar airspace that is bounded in several areas by foreign Air Navigation Service Providers (ANSPs). The diagram below shows how the funnel effect between the Contiguous United States (CONUS) and the Caribbean as well as the additional traffic into, out of, and through this funnel from ZNY and foreign ANSPs.

[5] Results do not include projection of traffic at ZSU. However, additional analysis does indicate that the projection of growth rate in ZSU is similar to the expected growth rate at ZMA.

Figure 5 Funneling Effect in NAS Caribbean Operation

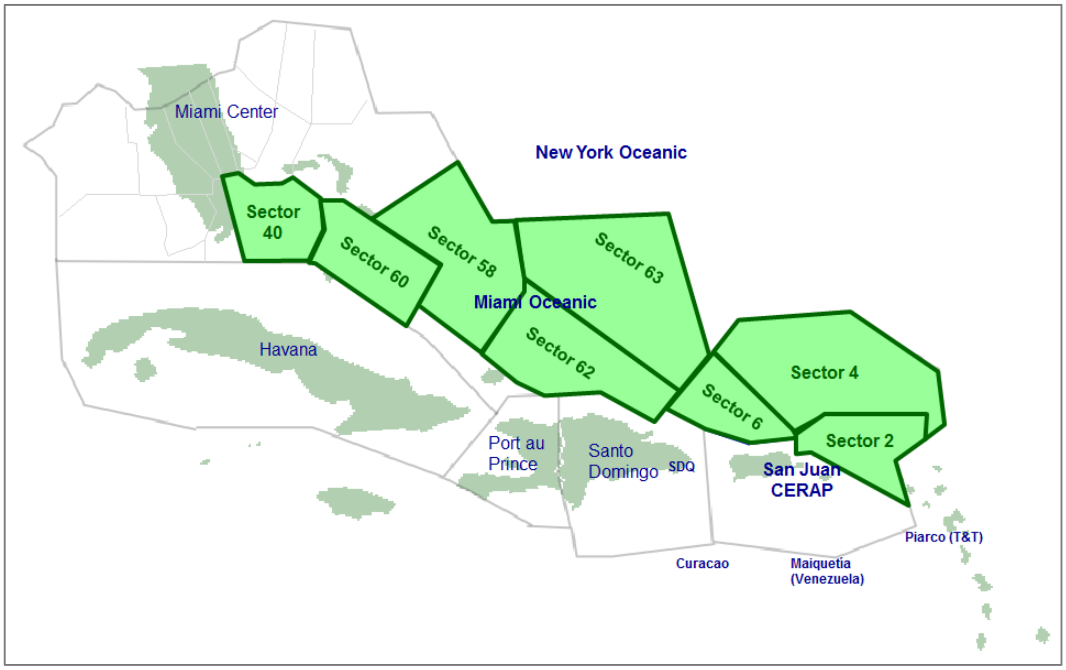


The growing traffic referenced earlier traverses this static funnel and creates additional complexity in airspace with a complex airway structure that has not been redesigned in many years. During peak traffic periods, current traffic levels are at a notional capacity for flow through this region. As a consequence, and as will be detailed later, the utilization of Traffic Management Initiatives (TMIs) to manage flow through the region on peak operational days has been a standard requirement in recent years.

Airspace Structure not Aligned to Current Traffic Demand

There are a number of areas in which the airspace structure in the Caribbean region may be improved. The current airspace structure is inconsistent with the traffic needs of the region and has not changed in many years. There is a mix of radar, non-radar and oceanic airspace and areas where communications are limited or unreliable. There is limited redundancy for communications or surveillance and manual coordination between ANSPs is the norm, thus reducing airspace capacity and increasing the likelihood of unpredictable delay. Facility outages increase risk, reduce airspace capacity, and increase controller workload. The following diagram presents key airspace sectors in the Caribbean discussed below:

Figure 6 Key Sectors of Interest in Caribbean Operations



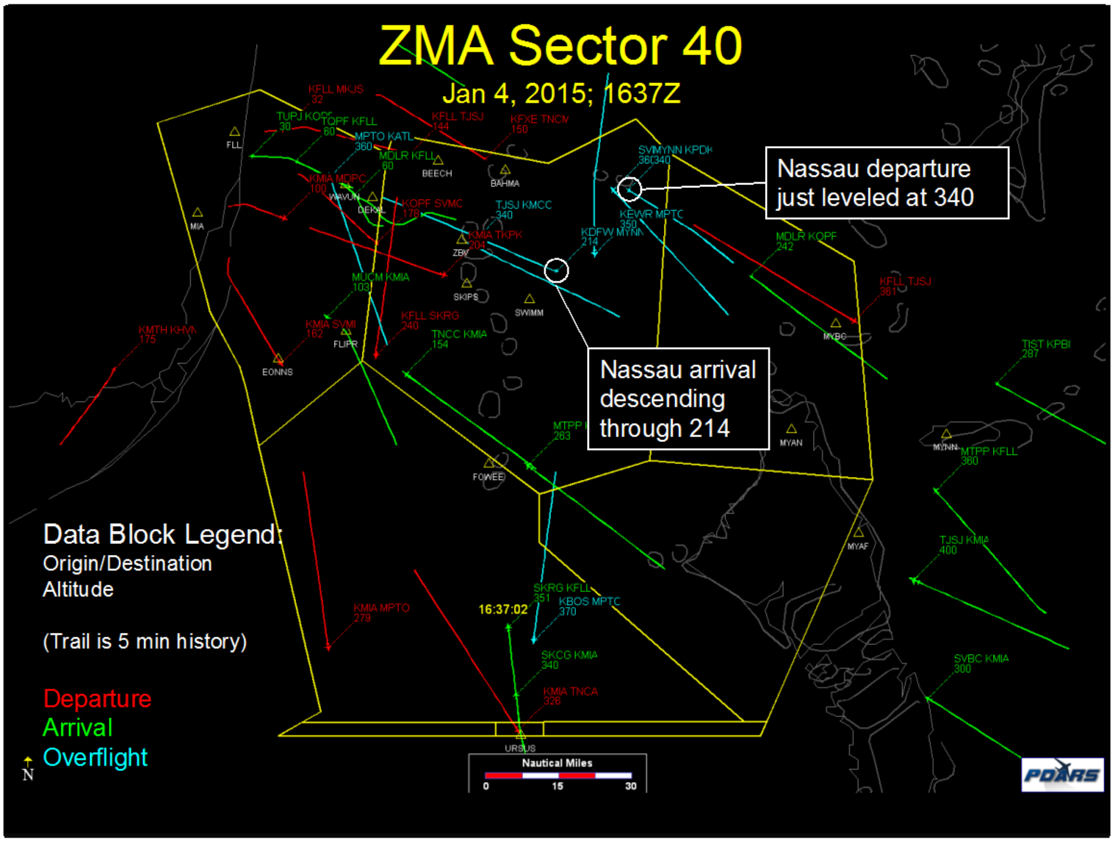
Safety Concerns in ZMA Sector 40

Sector 40 (R40) in ZMA, also known as the Bimini High sector, is located in the United States offshore airspace, east-southeast of Florida. It covers portions of the Bahamas and shares a common boundary with the Cuban Flight Information Region (FIR). Its vertical limits are flight level 240 and above. The traffic flow in R40 is not specific in terms of concise, directional, and streamlined patterns. The sector includes:

- Overflight aircraft in intersecting trajectories from north-eastern and north-western United States aerodromes, as well as east/west trajectories for flights originating in/destined to European aerodromes.
- Service to aircraft climbing and descending to/from Bahamian aerodromes.
- Sequencing arrival traffic destined to South Florida aerodromes (e.g. Miami Intl and Ft. Lauderdale Intl) from the southeast. Inbound traffic from internal adjacent sectors directly east and southeast, must blend with northbound traffic from Cuba to the south. This sector also controls south and southeast bound departure traffic from South Florida airports.

The snapshot below depicts some of these dynamics during a peak day in January 2015:

Figure 7 Sample Traffic in ZMA Sector 40



Source: Performance Data Analysis and Reporting System (PDARs)

The steady increase in traffic volume in a legacy airway structure that handles intersecting overflight traffic, as well as transition traffic descending and climbing to/from Florida, Bahamian, and Cuban aerodromes, has contributed to complexity and an increase in traffic conflicts in the Bimini High sector. These conflicts have led to an increase in operational incidents.

An incident in R40 in 2012 resulted in an NTSB inquiry into operations in the sector. The Investigator made a series of observations on Sector 40. (*Note that ZMA has addressed many of these observations already*):

Figure 8 Summary of Observations from NTSB Review of Sector 40

Observations from National Transportation Safety Board (NTSB) on Sector 40 in ZMA:

1 - **AIRSPACE DESIGN OF SECTOR 40-** review sector airspace for improvements.

2 - **STREAMLINING REROUTES:** Observation that reroutes need to reviewed to determine impact on sectors and contributory factors.

Final Comments: NTSB feels that this incident was the result of numerous contributing factors including but not limited to sector complexity and volume, lengthy reroutes and needed airspace updates.

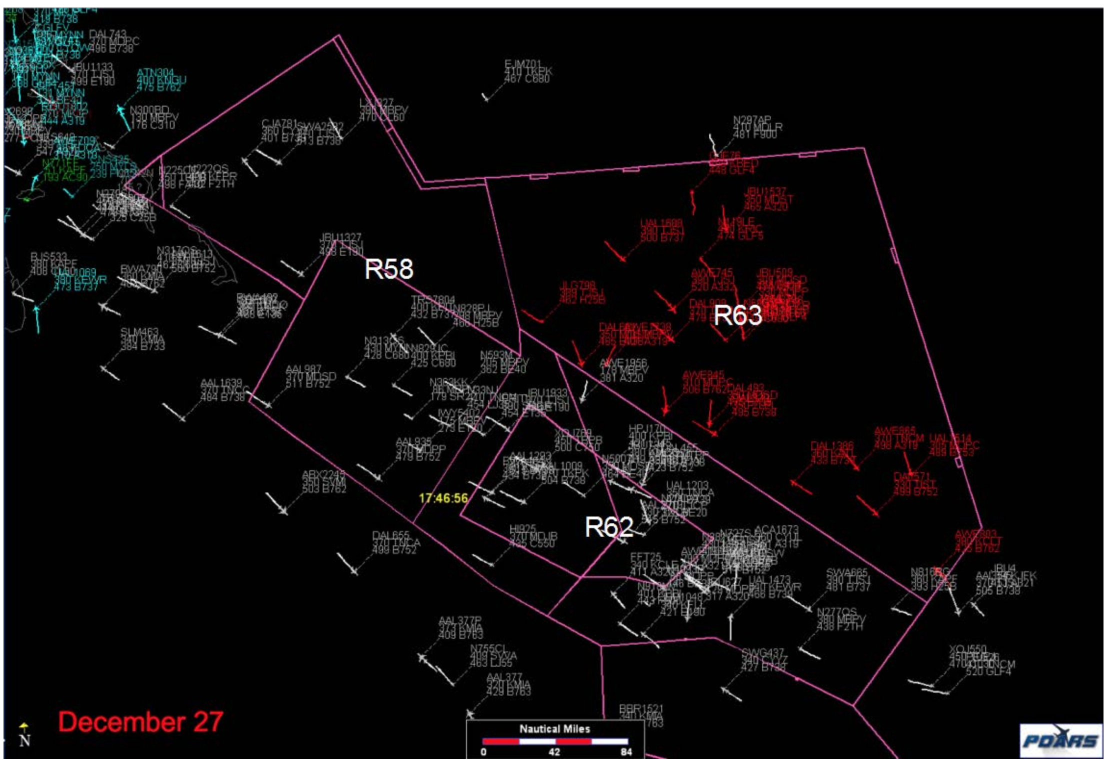
Improving safety in the Bimini Sector has also warranted discussion in the work of the ICAO North America, Central America and Caribbean Office (NACC). During Working Group meetings of the ICAO NACC, the FAA has recently presented a summary of the context of the operations in R40 as well as what is being done to mitigate the issues (Traffic Management Initiatives, probing traffic with the User Request Evaluation Tool [URET], Automated Data Exchange, supplemental training, etc.).

Finally, the expected increase in operations to Cuba will likely exacerbate the traffic demand through R40.

Volume in Large Oceanic Sectors in ZMA

Most sectors in ZMA are very large oceanic sectors, with some going from the surface to FL600. Aircraft spend long periods of time in these sectors, with the average flying time in Sectors 62 and 63, for example, being 34 minutes. The depiction below presents a snapshot of traffic in Sectors 58, 62 and 63 on December 27, 2014 at 17:46:56 Z. At this time over 30 aircraft are traversing sector 62:

Figure 9 Traffic through Large ZMA Oceanic Sector



Source: PDARs

Given the large area and flying times, the number of aircraft that may be traversing these sectors at any one time can be high and, therefore, challenging for a controller to manage. Even during optimal weather conditions, controllers may be managing up to 40 aircraft which drives workload for the controller. The following figure presents a sample of Traffic Flow Management (TFM) forecasted sector counts in key ZMA sectors on December 27, 2014, the same day depicted in the snapshot above. The numbers in red depict hours in which the number of aircraft in the sector are projected to exceed the

Monitor Alert Parameter (MAP) value. Note that for the picture above, Sector 62 was forecasted to have a peak of 38 aircraft at 1745 UTC.

Figure 10 MAP Numbers for Some ZMA Sectors on December 27, 2014

Max of Count

ZMA Sectors	MA	12:00	12:15	12:30	12:45	13:00	13:15	13:30	13:45	14:00	14:15	14:30	14:45	15:00	15:15	15:30	15:45	16:00	16:15	16:30	16:45	17:00	17:15	17:30	17:45
58	21	2	5	4	6	7	6	11	9	7	11	15	16	17	18	14	17	17	18	12	16	16	23	24	18
59	21	2	0	0	1	2	3	4	2	7	8	11	7	10	6	7	8	4	8	9	12	14	9	13	14
60	21	5	6	5	10	13	13	10	7	14	14	15	19	25	23	21	23	21	24	23	17	29	28	19	18
61	15	2	3	2	3	4	3	3	4	5	6	8	9	9	7	7	14	14	12	11	14	13	9	10	13
62	21	9	13	13	13	11	8	11	17	17	14	14	13	16	18	19	17	14	16	23	23	22	24	32	38
63	21	5	4	0	2	5	7	7	5	7	8	8	5	7	10	10	13	12	11	9	14	14	18	25	23

ZMA Sectors	18:00	18:15	18:30	18:45	19:00	19:15	19:30	19:45	20:00	20:15	20:30	20:45	21:00	21:15	21:30	21:45	22:00	22:15	22:30	22:45	23:00	23:15	23:30	23:45
58	22	20	21	20	23	19	19	14	14	20	23	22	18	18	15	15	15	19	19	12	12	12	11	7
59	9	7	17	18	13	14	11	7	9	14	13	14	12	11	12	9	7	8	9	11	9	8	10	7
60	15	27	28	22	22	15	14	14	19	22	20	23	25	22	16	20	24	24	19	20	15	12	12	14
61	15	16	12	14	11	5	14	11	15	15	9	17	18	12	8	7	12	12	14	13	12	11	12	11
62	30	23	23	23	24	24	24	26	24	21	16	18	22	25	24	21	22	18	18	19	13	11	14	14
63	25	21	18	17	16	11	14	14	12	13	15	18	20	16	14	12	12	11	12	13	13	11	7	10

Source: Traffic Flow Management System, data pulled from PDARs

When there is any operational anomaly in the system, such as weather, equipment outages, or airport congestion, there may be a significant workload increase on controllers managing these sectors, particularly if the event is unscheduled or unpredicted. For example, when pilots request deviations around severe weather, which may or may not be visible to the controller, it may impact multiple aircraft or traffic flows, thus increasing workload and complexity significantly. When these deviation requests are expected, it may be necessary to implement traffic management initiatives to keep the traffic volume manageable. Obviously any equipment outages create a similar or more extreme situation. Another example involving ground congestion can occur a several airports: Providenciales Airport (MBPV) has limited taxiway, ramp and gate capacity and may not be able to accept arriving aircraft. In such cases, MBPV requests ZMA to hold aircraft until an aircraft can depart MBPV to free up space on the ground for the incoming aircraft. The ZMA sector controller then must hold the aircraft awaiting arrival clearance from MBPV while managing the other aircraft traversing the sector.

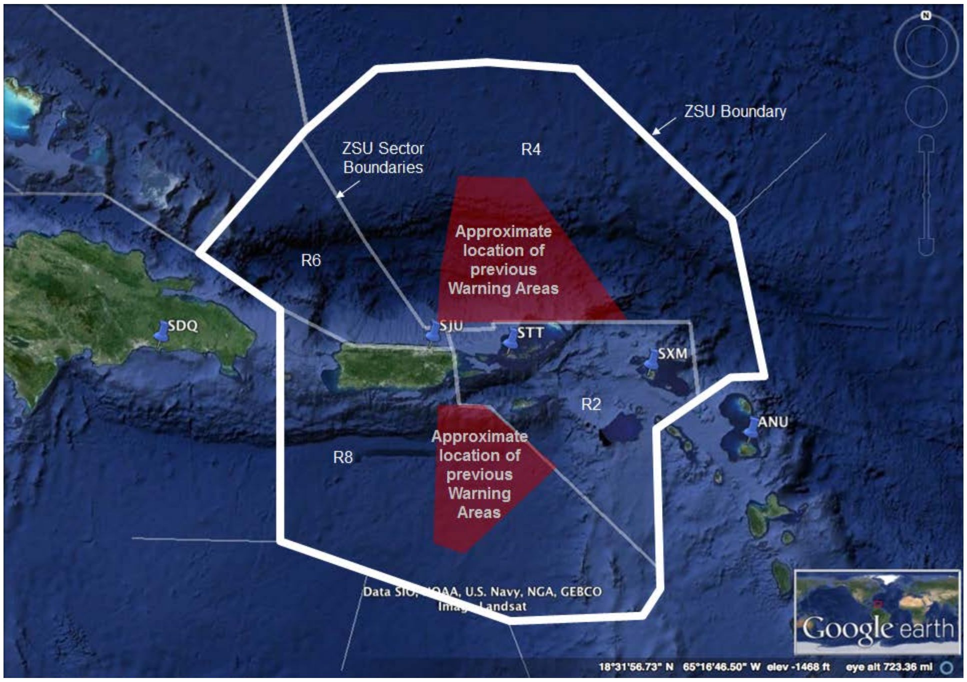
Finally, most facilities surrounding these large oceanic sectors are non-radar facilities or without automated data exchange, so time consuming manual coordination is required to transfer control.

Limited Airspace Structure in ZSU not Aligned to Current Traffic Demand

Finally, the airspace in the San Juan CERAP has not been redesigned in many years and no longer reflects the traffic flows and growth in the area. Existing ZSU sectors are based on legacy military traffic demand that no longer exists. The ZSU Approach sectors were designed around old Navy approach control airspace and the ZSU En Route sectors were designed around Warning Areas that were decommissioned as of October 22, 2007. As traffic flows evolved in the region since the Navy vacated in 2003, route structures and flows have changed to utilize the military airspace to help meet the new traffic demand but the current sector designs do not align with the route structures.

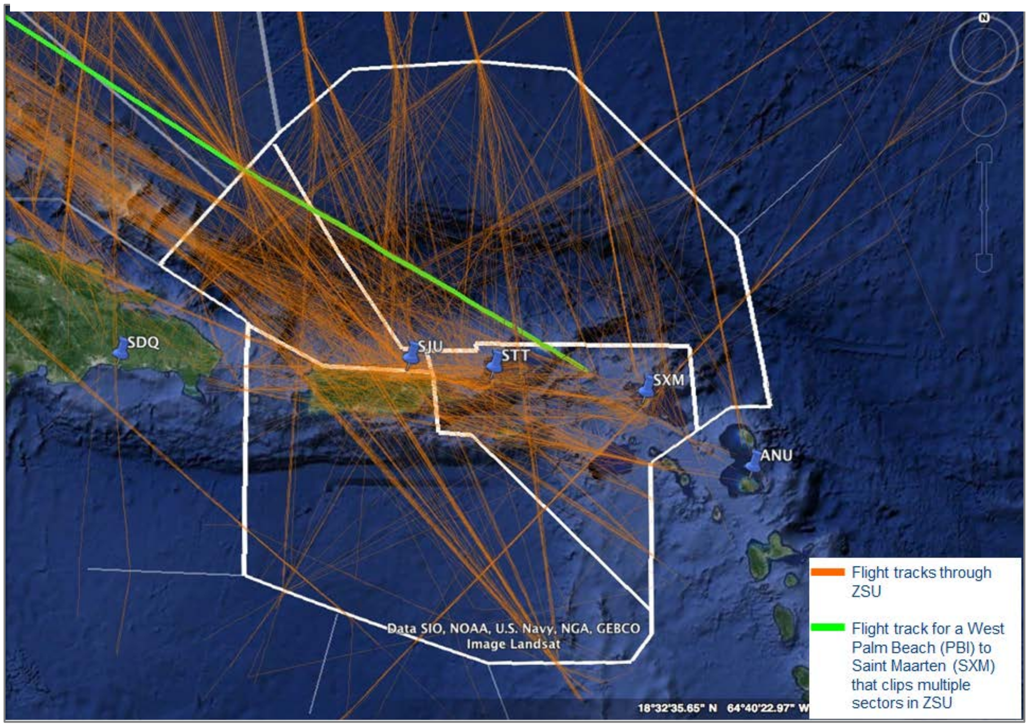
The diagram below shows that the four en route sectors were designed specifically around the warning areas associated with the Navy Base.

Figure 11 Approximate Location of Historical Warning Areas and Structure of ZSU Sectors



With the Navy base closed and most warning areas cancelled since 2007, the traffic flows in ZSU have adapted in response to the demand within the original airspace structure. The traffic flows adjusted but the sectors did not. Looking at the flows for one day in ZSU below, there is imbalance in the utilization of sectors with R6 and R2 the most utilized. R4 is also heavily utilized during certain conditions while R8 is least utilized. Additionally, the green line represents a flight from West Palm Beach (PBI) to Saint Maarten (SXM). Note that this flight is an example of one which crosses multiple sectors within ZSU, which creates unnecessary workload and complexity for the controllers.

Figure 12 Traffic Flows through ZSU on Peak Day (Jan 3, 2015)



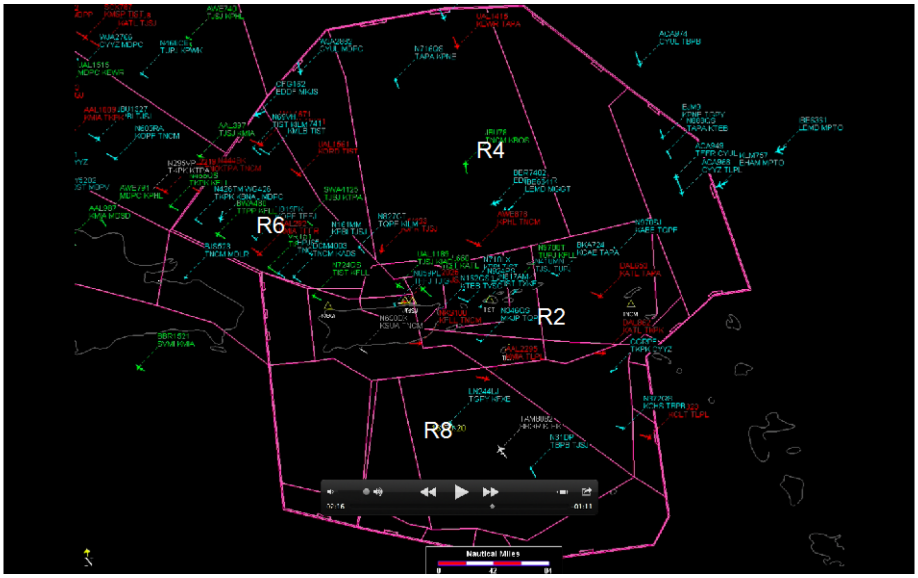
Source of flight track data: PDARs

The San Juan CERAP also has limited defined structure for its traffic flows. The diagram above shows a number of entry points into ZSU from which aircraft essentially proceed direct to their next destination within ZSU – either an airport destination or an exit point from ZSU. Although this may minimize route mileage, it creates a web pattern with increasing complexity and workload that ZSU controllers must manage. Recently, FAA has been evaluating the utility of a Traffic Management Unit (TMU) in ZSU to better organize flows and assist with managing demand capacity imbalances. However, for the longer term, there is a need to examine and possibly restructure the airspace using PBN, which not reliant on ground based NAVAIDs.

Sector 6 in ZSU, in particular, has the highest workload of the four sectors in the CERAP. R6 handles approximately 80% of arrivals into SJU in ZSU. The sector also deals with climbing and descending traffic from both Puerto Rico, the Virgin Islands and the Dominican Republic. Today, Traffic Management Initiatives are being used to manage the flow and ensure safety. In the FY2015 peak Caribbean season (December through April), ZSU requested miles or minutes in trail from ZMA on nearly 50 of the 120 days in the season. This frequency of TMI's has been approximately the same for the last three peak seasons (FY2013 through FY2015).

Sector 2 is second to Sector 6 in volume but higher in complexity. Frequency and Radar coverage limitations add to controller workload and decrease efficiency of traffic flow adversely affecting the sector's capacity. Finally, Sector 4 handles the majority of Oceanic traffic from Europe and feeds Sector 2 with traffic landing St. Maarten (TNCM) and V. C. Bird International Airport in Antigua and Barbuda (TAPA). When TNCM closes due to volume, Sector 4 has to hold the inbound traffic:

Figure 13 Snapshot of Imbalanced Volume in ZSU Sectors

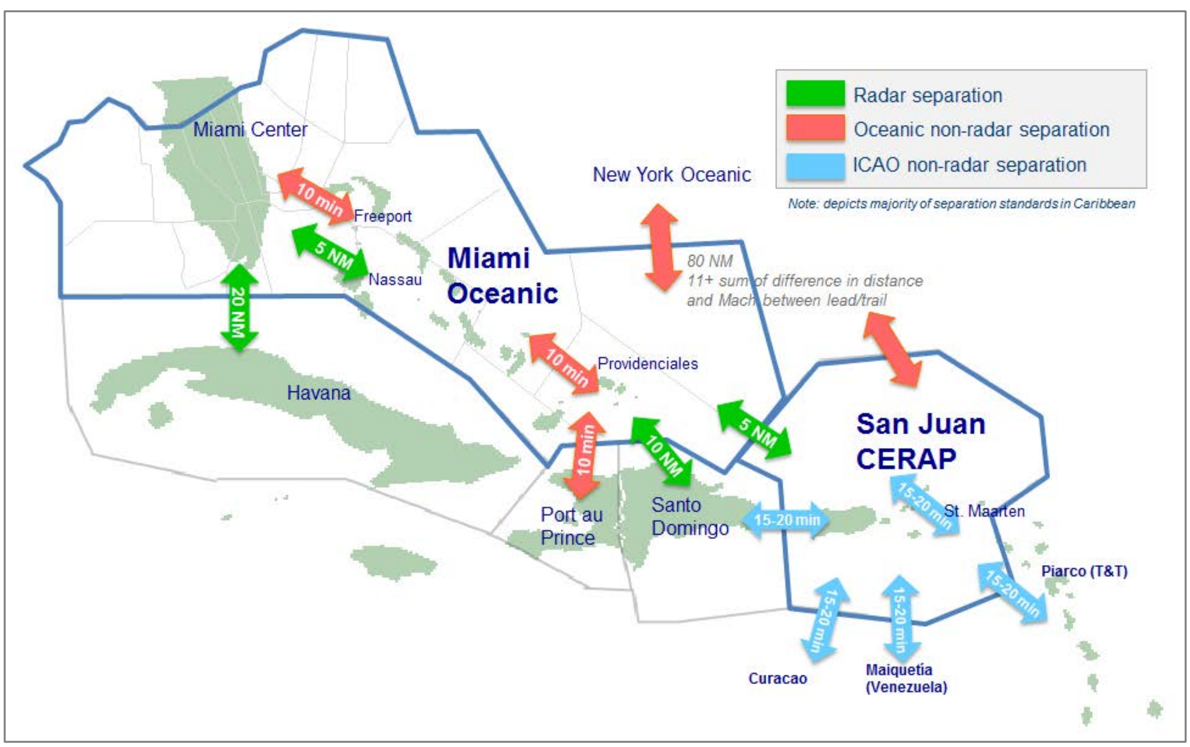


Source: PDARs

Infrastructure Issues in the Caribbean

Operations in the Caribbean are challenging for a number of reasons. One of the primary challenges for controllers at ZMA and ZSU is managing multiple separation standards which result from various levels of infrastructure in the region. The diagram below shows the different separation standards and the areas where transitions are required to accommodate traffic flows in the Caribbean operation:

Figure 14 Transitions between Different Separation Standards in the Caribbean



The separation standards used in the Caribbean are "Procedural" Separation and Radar Separation. The Procedural Separation can be further divided into two methods, Non-Radar and Oceanic. When listed by distance required for separation, Oceanic generally requires the greatest distance for separation, Non-Radar requires less distance than Oceanic but more distance than Radar, and Radar requires the least distance for separation and is therefore the most efficient.

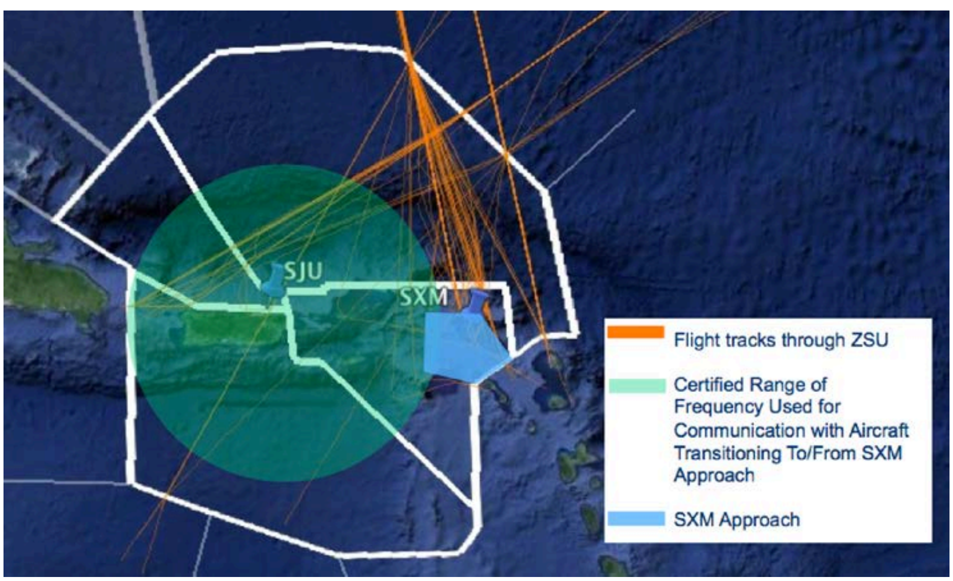
Both Non-Radar separation and Radar Separation require immediate communication with the aircraft involved. Radar Separation requires a surveillance source (primary radar, secondary radar or ADS-B/Wide Area Multilateration [WAM]). As currently configured, surveillance and communications sources must be land based. In an area with large expanses of open water, lacking ground-based communications and surveillance and served by multiple foreign ANSPs, airspace capacity and efficiency are constrained in order to ensure safety and manage controller workload.

The following is a summary of the various infrastructure limitations and the resultant challenges impacting the Caribbean airspace today:

Communications Gaps Drive Increased Separation for Contingency Management

There are blocks of airspace in the Caribbean with gaps in direct pilot-controller radio communication. For example, in the Northeast segment of ZSU, the frequency used to communicate with aircraft being transitioned to or from SXM Approach Control is only certified to the Western edge of SXM Approach. This frequency has an "official certified range" of 132 NM, and SXM is located 152 NM east of the 118.15 MHz transmitter site. Coverage beyond 132 NM is unreliable.

Figure 15 Flight Tracks Potentially Impacted by Lack of Certified Frequency Coverage in ZSU



Controllers handling traffic in ZMA and ZSU state that their first priority is to have communications with aircraft; if a controller can communicate with an aircraft, then various separation standards are available to ensure a safe and efficient operation. Currently there are gaps in the region that make communications periodically unreliable. The result is a requirement for additional separation to safely manage contingencies.

Another significant frequency coverage gap is for operations in and out of Providenciales ("Provo") Approach Control airspace in the Turks and Caicos Islands. Installation of a new frequency has been a high priority in the region for several years and it has just recently received the required funding. It is expected to be completed in Fall 2015.

Single points of failure/Lack of redundancy

There are multiple single points of failure in Caribbean operations. On March 28, 2015, for example, ZMA's Oceanic sectors experienced a communications outage. Due to high volumes of crossing traffic in that airspace, the outage caused Sectors 62 and 63 in ZMA to revert to procedural separation of 10 minutes in trail above FL200 and 20 minutes in trail below FL200. This was done in an effort to reduce the volume of traffic in the airspace. Subsequent reroutes and other Traffic Management Initiatives resulted in significant operational disruptions and diversion of 36 aircraft.

Another single point of failure in the Caribbean is the radar site at Grand Turk. This site is a critical source of surveillance for flights traversing ZMA's Sectors 62 and 63. In the diagram below, the figure on the right depicts radar coverage in the Caribbean when Grand Turk's radar is out of service. Orange lines are flight tracks that traverse ZSU:

Figure 16 Radar Coverage in the Caribbean

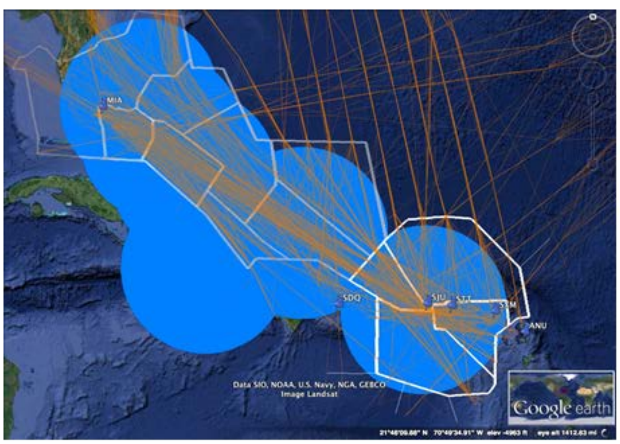
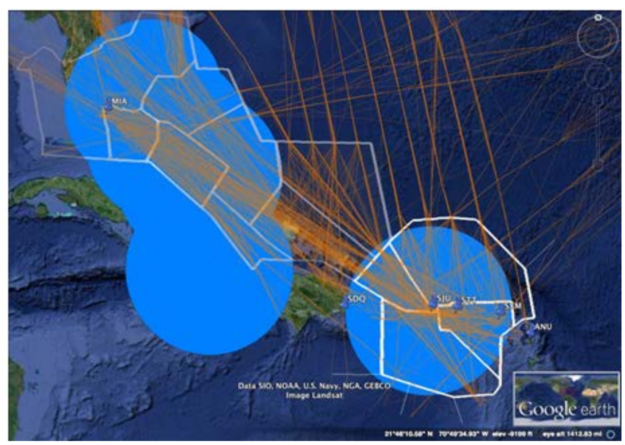


Figure 17 Radar Coverage in the Caribbean when Grand Turk radar is Out of Service



When this radar site is out of service, whether scheduled or unscheduled, it results in reroutes and volume reductions that cause delay and additional fuel burn and can impact thousands of passengers. ZMA personnel indicated that the Grand Turk radar was out of service 7 times during CY2014. An analysis of operations from a peak day in January 2015 indicated that approximately 700 flights are impacted on a peak season day. It is estimated these seven outages cost flight operators $2-3 million in extra fuel burn. Additionally, there are incremental costs associated with missed passenger connections and delays impacting crews and aircraft.

ZSU Automation Platform's Dependency on ZMA Limits Functionality and Improvement

San Juan CERAP utilizes the Micro EARTS automation platform for air traffic control. ZSU does not have its own Flight Data Processor (FDP) and relies on ZMA's ERAM system for flight data processing. Miami ARTCC serves as the automation parent facility for San Juan CERAP. All data communications to the STARS/MicroEARTS serving a TRACON/CERAP is routed to that facility via the Parent Center. It does not go directly to the ARTS/CERAP facility without first passing through the parent center. Miami provides flight data and flight strip processing for ZSU.

As a result, any change in the ZSU MEARTS automation platform requires ZMA to adapt the change into its ERAM system. For example, any changes to routes or sector boundaries in ZSU must be implemented in ZMA. While this is possible, it requires additional coordination and linkage to other systems before ZSU can benefit from improvements in its automation system. Additionally, when the ZMA FDP is offline, ZSU loses all flight plan information, including call sign, beacon code, fixes, altitudes, etc. Finally, the lack of independent flight data processing requires additional resources in the ZSU controller team. Flight plans are activated and/or amended in ZSU via Flight Data Input/Output (FDIO) Equipment.

MEARTS is not expected to be retired in the near future, particularly because it serves a critical function for the ATOP (Advanced Technologies and Oceanic Procedures) platform. However, it may be retired as a standalone automation system. Contractually, MEARTS is renewed on a year-to-year basis so making investments into new capabilities is more challenging from a programming and budget perspective. As a result, ZSU MEARTS lags behind in capability to the rest of the NAS. For example, MEARTS is not included in the Waterfall for Data Comm and requires additional software translators for Automated Data Exchange with other ANSPs in the region.

Weather Information Gaps Create a Safety Hazard

Lack of real time weather information on the controller's scope is another limitation in the Caribbean. ZMA Oceanic has limited real-time weather information available and ZMA weather radar is only available within about 150 NM of Miami. An Air Traffic Safety Action Program (ATSAP) Corrective Action Report (CAR) issued in 2011 notes that "lack of weather radar presentation, within airspace overlying the Caribbean area of Miami ARTCC (ZMA), creates a safety hazard."[6]

ZSU has NEXRAD data available but this system has a 5 to 7 minute time lag on the controllers' scopes. It has availability and coverage issues and is dependent on ground stations for information. As backup to the NEXRAD, ZSU only has weather radar with 60 NM coverage around San Juan (SJU) and Saint Thomas (STT). Additionally, blind spots in weather information exist to the east of SJU along the western and southern boundaries of SXM Approach Control due to terrain limitations.

Flight crews have reported that there are times in tropical atmospheres where there is so much water aloft that the radar attenuates and no longer paints an accurate picture. Given that Caribbean operations are in areas of significant convection and flow through "Hurricane Alley," the complete lack of weather information in multiple sectors in ZMA and unreliable information in ZSU can create operational challenges, compounded by lack of common situational awareness with flight crews. When pilots and controllers have different understandings of evolving weather, time is required for the two

[6] From: "Air Traffic Safety Action Program Corrective Action Plan, Monthly Report, April 2015"

parties to safely resolve the conflicts. This additional time and workload are particularly problematic in the large Oceanic sectors in ZMA, such as Sectors 62 or 63. Oftentimes when severe weather is present, routes must be closed or traffic dramatically reduced to allow for deviations.

The TG was shown a recent example that illustrates these issues:

An air carrier flight was in Cruise at FL360 at approximately 160 nm east of GTK. The flight crew coordinated with ATC and inquired about ride reports and deviation requests as they were painting weather ahead (approximately 150 miles). ATC had no previous aircraft through the area and therefore no ride reports. The crew also sent dispatch a message requesting a look at the radar ahead. The flight deviated to the left (South) of course (upwind) of the targets painted on the radar. Flight approached the system well over 40 miles from any painted returns while in IMC [Instrument Meteorological Conditions] conditions the entire time. Crew continued with multiple scans, changing gain and range along with tilt. The flight experienced severe turbulence and a possible lightning strike.

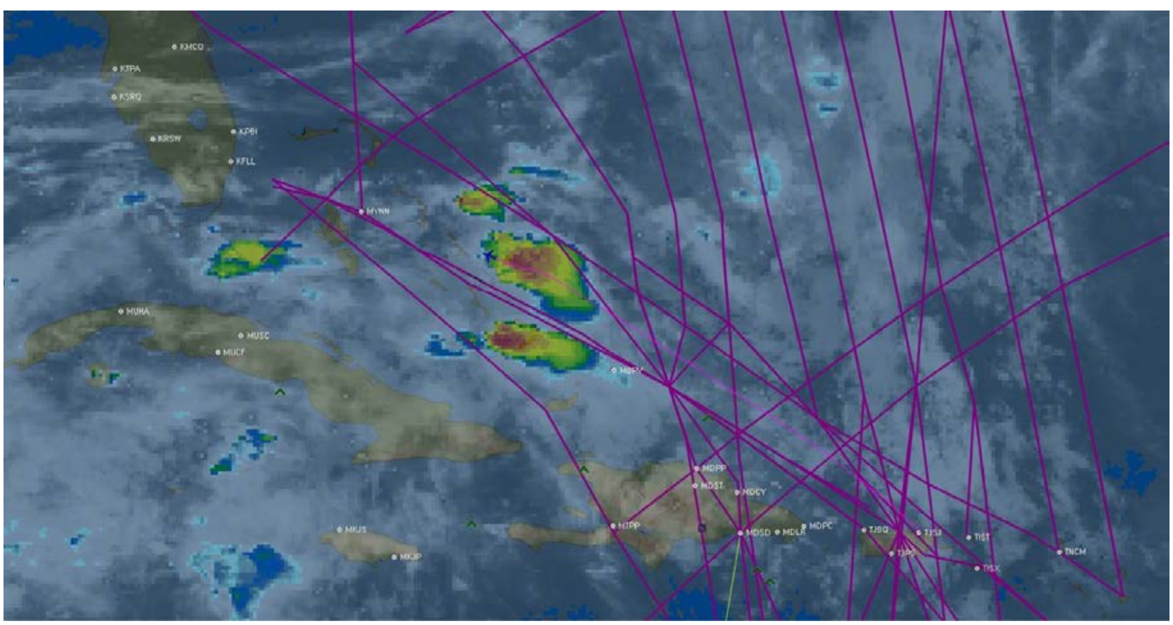
The event report was summarized in the following way:

ENCOUNTERED SEVERE TURB. @ FL 360, AT 0730Z. LOST 1000FT WITH AN DOWNDRAFT. LOCATION WAS 2405N/7438W.

ALSO HAD A LIGHTNING STRIKE ZQA147@120. NO INJURIES OR DAMAGE TO AIRCRAFT. MOR ENTERED WITH #2015/06/05-0001.

Finally, the following is a depiction of the aircraft and weather during this incident:

Figure 18 Example Weather in Caribbean on June 5, 2015



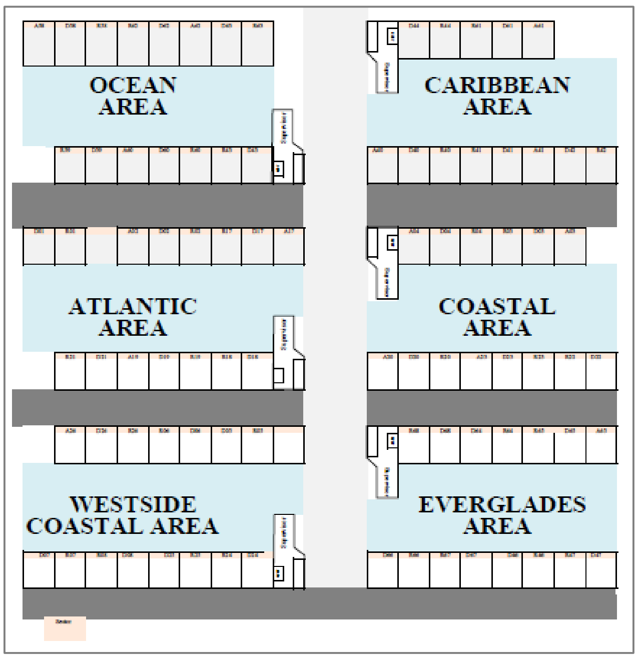
Source: WSI

When in domestic US airspace, controllers add an additional level of safety by alerting flight crews to areas of moderate or greater precipitation when it's on their route and inquiring if they would like to deviate. If real time weather information was available to ZMA and ZSU, controllers could provide critical safety of flight information and better manage traffic flows through areas of severe weather.

Space Constraints in ZMA Limit the Pace of Airspace Resectorization

The airspace challenges discussed earlier suggest that there may be a need for new physical sectors in ZMA and ZSU. However, for ZMA, there is no floor space currently available in the facility for an additional sector. The diagram below depicts the current layout of the ZMA control room. Note that there are currently no free physical sectors in this space. ZMA Management is currently researching options to free up space on the floor to accommodate a new sector.

Figure 19 ZMA Control Room Layout



Surveillance Gaps Drive Increased Separations

Finally, there are surveillance gaps in ZSU today. Aircraft transitioning between ZSU and SXM approach, for example, are not visible to ZSU until just before they enter ZSU airspace. Additionally, given the prevalence of oceanic airspace along the boundaries of Caribbean airspace, there are multiple boundary crossings with oceanic facilities that do not have radar coverage.

Regional Coordination Challenges

Manual Workload Requires Up to a Three Person Team to Operate one Sector

As noted and depicted earlier, there are numerous adjacent and underlying foreign ANSPs bordering both ZMA and ZSU with various transitions of separation standards. Most require manual coordination and handoffs between facilities, usually via telephone landlines; flight plan information is also passed manually between facilities along with altitude and crossing time estimates.

On a typical day, a sector in ZSU requires three controllers to manage the sector – an R side, a D side and an A side. The R side controller is communicating with aircraft, the D side is often on the phone transferring information to/from foreign facilities and the A side is entering, correcting and generally managing the information. This process requires two of the three controllers (D and A sides) to be involved in “heads down” work. Additionally, with language differences in the region, manual transfer of information results in frequent miscommunications that either drive additional time to clarify or the passing of incorrect information. These situations increase risk and may decrease sector capacity, and would be less prevalent with automated transfer of information (ADE).

No Regional Traffic Management Limits Facility Control of Flow and Penalizes US Operators

The high number of adjacent and underlying foreign facilities also creates challenges in managing traffic flow in the region, particularly in an increasingly congested operational environment. ZMA and ZSU have some level of informal coordination with neighboring facilities, but there are no formal agreements for an integrated air traffic management concept. While there is a strong sense of cooperation between facilities in the region, currently there are no mechanisms to levy restrictions on foreign ANSPs or aircraft to manage throughput and controller workload. As a result, when there is a need in US facilities to manage traffic, domestic flights originating from or destined to the United States get penalized to manage the overall demand. These are the flights the FAA can regulate; hence these are the ones that get controlled when it is required. With a regional Air Traffic Flow Management (ATFM) structure, all participants would be governed by traffic management which would result in a more equitable distribution of initiatives.

Summation of Current Operational Problems in Caribbean

There are a number of dynamics intersecting in the Caribbean that highlight the need to expeditiously address the airspace, infrastructure and connectivity deficiencies in the region. Air traffic demand in ZMA and ZSU airspace is currently the only region in the NAS that both has grown in recent years and is projected to grow in the future. The airspace is at capacity today, particularly during the region’s peak season when the most passengers want to travel. Structural limitations in the airspace design drive problems in both individual sector safety and efficiency and controller workload. Compounding the airspace deficiencies is a series of infrastructure limitations in the region including single points of failure, facility space limitations, lack of automation capability and gaps in communications, weather information and surveillance. Finally, interfacing with the many foreign facilities neighboring or underlying ZMA or ZSU airspace requires extensive manual coordination, increasing controller workload and limits any structured approach to regional traffic management.

As discussed earlier, there are a series of safety concerns in this region, including NTSB observations of complexity in Sector 40 and large over-water sectors that regularly have very high volumes of traffic. To manage volume and ensure the highest levels of safety, the operating facilities in the region in conjunction with the Air Traffic Control System Command Center (ATCSCC) regularly utilize Traffic Management Initiatives such as Airspace Flow Programs (AFPs) and Miles/Minutes in Trail (MITs). Of the approximately 128 days during the 2015 peak winter Caribbean travel season, the region experienced 20 AFPs and about 50 days in which ZSU and ZMA passed back MIT restrictions to other facilities.

Operational Needs in the Caribbean

This section of the report presents a series of operational priorities that, if implemented, would address the airspace and infrastructure challenges in the Caribbean and benefit the safety and operational performance issues raised. The full set of operational needs is presented in Appendix A: Detailed Assessment of Operational Needs. Each item in the package is discussed in more detail below. This section is divided into a discussion of Infrastructure Priorities and Airspace Priorities. Ultimately, the improvements should be packaged in a way that enables them to complement one another and be implemented in the shortest possible time. This may involve using existing budget line items for communications and surveillance, NextGen funding, a new comprehensive budget line item focusing on improving the infrastructure in the region, or some combination of all three.

Infrastructure Priorities

The following is a set of infrastructure improvements that should improve the safety, efficiency and capacity of the airspace corridor controlled by Miami Center and San Juan CERAP. The ERTG has categorized and prioritized these into four broad categories: Communications, Surveillance, Automated Data Exchange and Technology Improvements. The first three of these categories relate to infrastructure improvements that utilize existing technologies to address gaps and improve operations in the region. The final category (Technology Improvements) relates to improvements that leverage new technologies that are being implemented or are available in the rest of the NAS. Priorities were developed based upon the number of operations impacted as well as perceived operational benefits in terms of safety, capacity, efficiency and reductions in controller workload.

Communications

Increasing communications in areas that currently have none or in areas that have incomplete coverage will increase safety and efficiency.

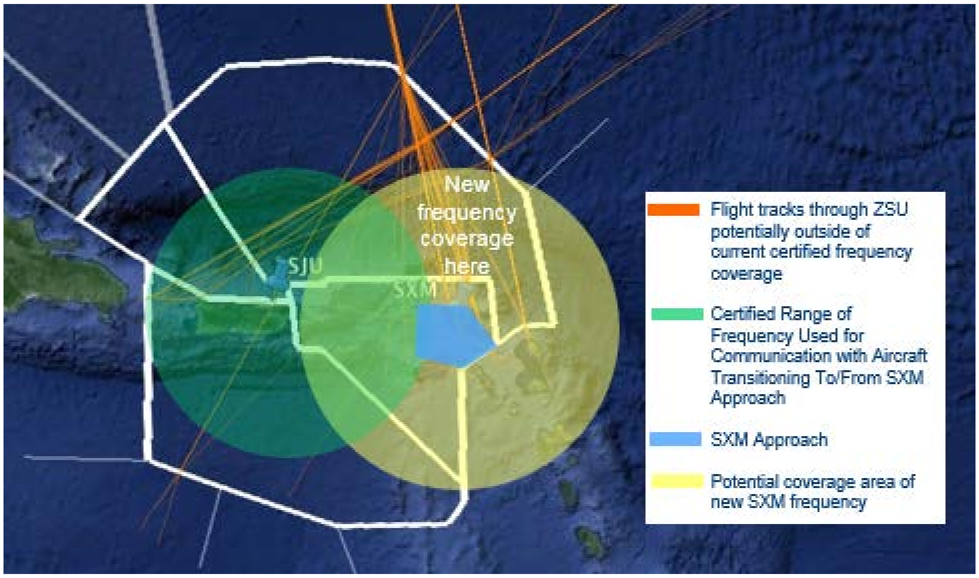
Implement a New Communications Frequency at Saint Maarten

This is a new frequency that will extend the area of communications for ZSU's northeast oceanic Quadrant. The lack of reliable communications in this area currently affects approximately 120 flights a day. This results in inability to communicate with aircraft or requires controllers to make multiple broadcasts to complete one transmission for about 15% of aircraft in this area. Additionally, this frequency is out of service approximately 4 times per year. Deployment of this frequency will ensure consistent communication with aircraft transiting this area and result in a safer, more efficient operation.

The SXM frequency requires new digital radios with communications through FAA Telecommunications Infrastructure (FTI). The frequency could utilize existing funding streams for communications. Additionally, this will require final execution of draft international agreements with St. Maarten that include an annex for establishing an FAA-owned air-to-ground radio site (RCAG) in and on the air traffic control tower in St. Maarten. This agreement would be updated after this requirement is validated and funded.

The diagram below presents an approximation of the coverage impact the new SXM frequency would provide:

Figure 20 Potential Increased Communications Coverage from SXM Frequency



Implement a New Communications Frequency at Abaco Island

This is a new frequency in the Northern Bahamas. It will improve communications with aircraft operating at lower altitudes in the Northern Bahama area. Additionally, it will improve coverage gaps that exist today along the ZNY-ZMA boundary. Filling this gap, along with a boundary change between ZNY and ZMA, will allow aircraft to consistently cut corners on existing routes resulting in time and fuel savings. This will also provide opportunities to help controllers with traffic saturation and weather deviations. The frequency would also be required to consistently take advantage of any increased surveillance afforded by ADS-B in the Caribbean. (*Both the Shortcut Route and ADS-B are discussed further below.*)

This frequency is a new requirement and no validation work has been done to date. Both countries will benefit from the safety and efficiency offered by this new frequency, particularly if complemented with new surveillance from radar or ADS-B.

Install Dedicated Shout Lines with Certain Adjacent or Underlying International Facilities

Communications with most international facilities adjacent to ZSU is presently accomplished by conventional telephones. A controller dials the number of the international facility and waits for someone to answer. Information is exchanged between the controllers on the phone, and that information is then relayed to the R-side controller working the sector. A dedicated “shout line” is a line that puts the controller directly in communication with the international facility at the sector needed. By push of a button, a controller in ZSU, for example, would have the functionality to speak directly into the headset of the controller in the international facility with which he or she is coordinating.

Shout lines eliminate the requirement for a telephone call and any corresponding delays and wait time. This will save the controller time and allow the controller to stay focused on the traffic display. It will increase efficiency and help eliminate route extensions or holding for aircraft while coordination is accomplished.

Priority for shout lines is correlated to the number of handoffs between ZSU and adjacent facilities. The table below provides a priority of shout lines based on an estimate of the number of aircraft affected daily. Shout lines to Beef Island and Piarco are the two highest priorities:

Figure 21 Number of Aircraft Impacted by Shout Line with Neighboring Facility to ZSU

Neighboring Facility	Number of Aircraft Impacted
Beef Island, USVI (TUPJ)	Significant volume of Visual Flight Rule (VFR) traffic
Piarco, Trinidad and Tobago (TTZP)	170 flights per day
Maiquetia, Venezuela (SVMI)	27 flights per day
Curacao (TNCC)	12 flights per day

Source: Analysis of PDARs flight tracks on peak operational day of January 3, 2015

Installation of a shout line is not trivial as it requires site surveys as well as connectivity to multiple international locations.

Automation

Regional Implementation of Automation
a) Continue implementation of ADE with Santo Domingo
b) Develop software translation for neighboring facilities with AIDC protocol
c) Ensure ERAM software upgrades associated with ADE stay on schedule

In the Caribbean region, there are multiple adjacent and underlying foreign facilities which require manual coordination. The transferring controller in one facility must call the receiving controller in the other facility and give an estimate of the position and altitude at a crossing point along with the beacon code. This is done approximately 10 minutes prior to crossing. If this is not accomplished before a specified, safe distance from the boundary between the two facilities, the aircraft must be turned away from the receiving controller's airspace and held until the handoff can be accomplished. This may result in the aircraft having to hold or make a wide circle before returning to its assigned route resulting in delay and additional fuel burn.

The current process is time and labor intensive as it requires making phone calls, answering phones and waiting for approval from the specific controller working the sector. Frequently, controllers are required to pass complete flight plan information. This increases controller workload and reduces airspace capacity as additional separation must be built in to accommodate the manual process.

Interfaces between automation systems in the US and foreign facilities can assist controllers by reducing the need for voice communication and manual data (flight plan) transfer between facilities. A protocol which uses North American Common Coordination Interface Control Document (NAM ICD) performs

Automated Data Exchange (ADE). This has three classes which offer increasing levels of automation between facilities with the ultimate goal being non-verbal transfer of control, i.e., automated hand-offs.

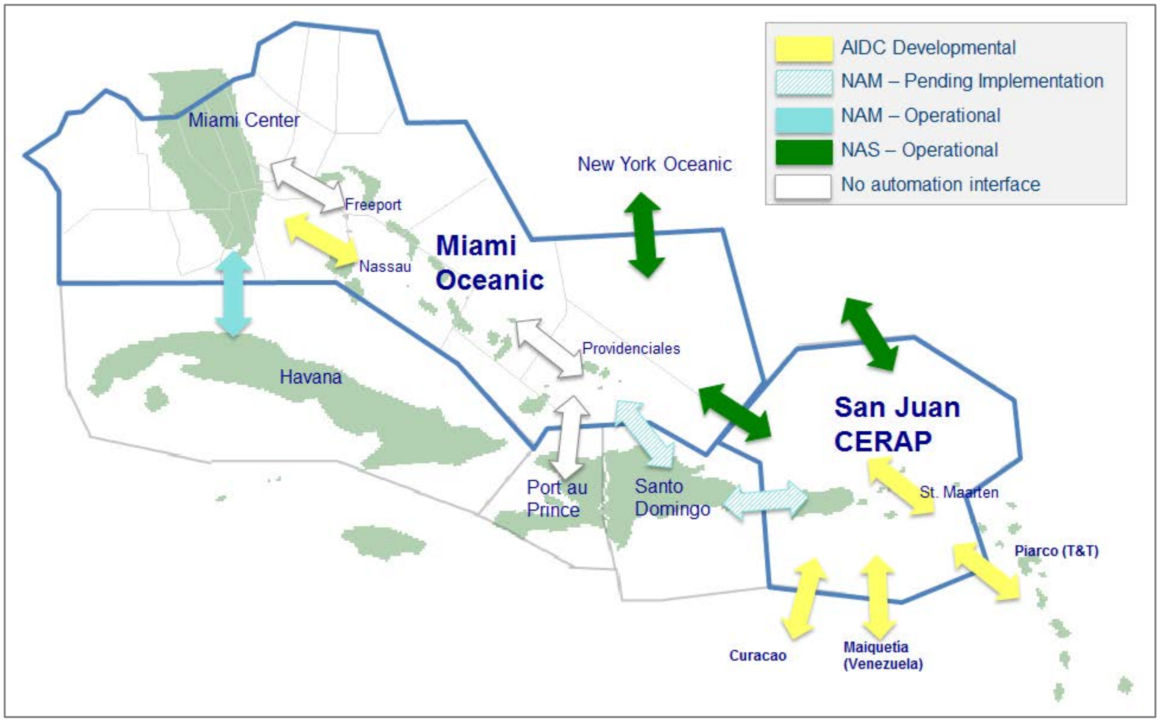
The three classes are:

1. Transfer of current flight plan information and time over given fix. Transfer of control is completed manually via a phone call to confirm handoff between neighboring facilities. All changes to a previously submitted flight plan are done manually.
2. Includes all of Class 1. Additionally, any changes to flight plan information are transferred via ADE automation. Changes include modification of flight plan, cancellation, etc.
3. Automated handoff of aircraft and optional point out capability.

Having access to this information in a more timely and automated manner allows the controller to plan for traffic entering the airspace and results in a safer and more orderly flow of traffic. Class 1 ADE has been implemented between ZMA and Havana Center. A recent analysis of automated flight plan transfers indicated that over 95% of flight plans were successfully transmitted via automation, reducing the manual effort to activate flight plans and mark up flight strips.

The diagram below indicates status of ADE in the Caribbean. Class 1 ADE is in place between ZMA and Havana and in development between Santo Domingo and ZMA and ZSU. The six facilities with arrows labeled in yellow – Curacao, Maiquetia, Piarco, St. Maarten, Nassau – all operate systems on a similar ATS Interfacility Data Coordination (AIDC) protocol that would require one automation translator between ERAM and these systems to implement ADE. There is opportunity for one software effort to enable improvement of automation interfaces with at least five foreign facilities. This is estimated to be a significant software endeavor involving development, testing and configuration with multiple facilities. The US is centrally located and the only country with the requisite expertise and resources to drive a seamless ADE solution for the region.

Figure 22 Automation Interface Protocols between/within NAS and Foreign Facilities in Caribbean



A list of key adjacent facilities is shown below with an estimate of the number of aircraft affected daily:

Figure 23 Number of Aircraft Impacted by ADE with Neighboring Facility to ZMA/ZSU

Neighboring Facility	Number of Aircraft Impacted
Santo Domingo FIR (MDCS)	400+ flights per day with ZMA 86 flights per day with ZSU
Piarco, Trinidad and Tobago (TTZP)	170 flights per day with ZSU
St. Maarten (TNCM)	120 flights per day with ZSU
Maiquetia, Venezuela (SVMI)	27 flights per day with ZSU
Curacao (TNCC)	12 flights per day with ZSU

Source: Analysis of PDARs flight tracks on peak operational day of January 3, 2015

Assuming that this saves just 1 minute of controller time per flight, Automated Data Exchange will save 6 hours of controller time per day for flights between ZMA-MDSD, 1.5 hours per day for flights between ZSU-MDSD, 3 hours for flights between ZSU-TTZP and 2 hours for flights between ZSU-TNCM. This is a conservative estimate when considering the savings at peak demand periods and seasonal demands.

In addition, ADE allows for improved utilization of the airspace capacity as controllers have more time to focus on separating and managing traffic and less time manually coordinating information. This drives a better use of capacity and a possible reduction in TMIs.

The ERTG recommends that the FAA actively continue pursuing ADE with Santo Domingo FIR (MDCS). Initial work suggests that Class 1 implementation should be possible within the next 12 months and this should be expedited to the extent possible.

In addition, the ERTG recommends the FAA develop the software translation required to enable ADE with the neighboring foreign ANSP facilities that operate on the AIDC protocol.

Finally, there are ERAM software upgrades underway associated with ADE. Software is planned to enable Class 3 handoffs within ERAM. This would be required to eventually reach Class 3 ADE with Cuba and the Dominican Republic. The current software effort is slated for 2018 in support of implementation with Canada. The ERTG supports this effort and recommends moving it earlier in the schedule.

The ERTG also reviewed the timeline for ERAM-ATOP interface software development that, within FAA facilities, will eventually enable full transfer of control between ERAM and ATOP. The timing for this software activity has been delayed until 2020. The ERTG believes this activity should retain its current position in the ATOP Waterfall.

Implement Independent Flight Data Processing in ZSU

Currently, the ZSU Micro EARTS platform relies on ZMA ERAM for flight data processing which requires all adaptation and data for ZSU to flow through ZMA's ERAM. This extra step hurts ZSU in its ability to access improvements to its automation. This effect is seen, for example, with ZSU not being on the Data Comm Waterfall schedule.

The ERTG recommends that ZSU acquire its own Flight Data Processor, similar to Anchorage's use of MEARTS with its own FDP. This would enable ZSU to independently pursue the automation improvements most critical to its operation. Some improvements from independent flight data processing include:

- Flight plan readout: "slew and enter on data block." When resolving air traffic and/or flight plan issues in real time, ZSU controllers may have to search for the physical strip among many. Once the strip is found, the controller must mentally consider the flight plan going forward. If any changes are required, the controller must coordinate with the A side controller to make the changes in the FDIO equipment. With independent flight data processing, the flight plan can be pulled up on the radar display and amendments can be made directly from the Radar Position without A-side coordination.
- Route readout: draws a line depicting the planned route of flight on the glass for a specified number of minutes ahead of current time. Aids in conflict detection.
- Allows for use of full four letter ICAO code. The current process only uses 3 characters. This has created confusion and incorrect depiction of aircraft location for the controller. For example, St. Thomas is identified as TIST and St. Croix is identified as TISX. When the fourth character is dropped, both locations are TIS and there may be system confusion as to which location is being referenced.
- In the event of an outage in ZMA, ZSU maintains ability to conduct normal facility operations with any facilities not impacted by the underlying event.
- With appropriate radar data sharing in place, enables radar handoffs between ZSU and ZNY in the future.

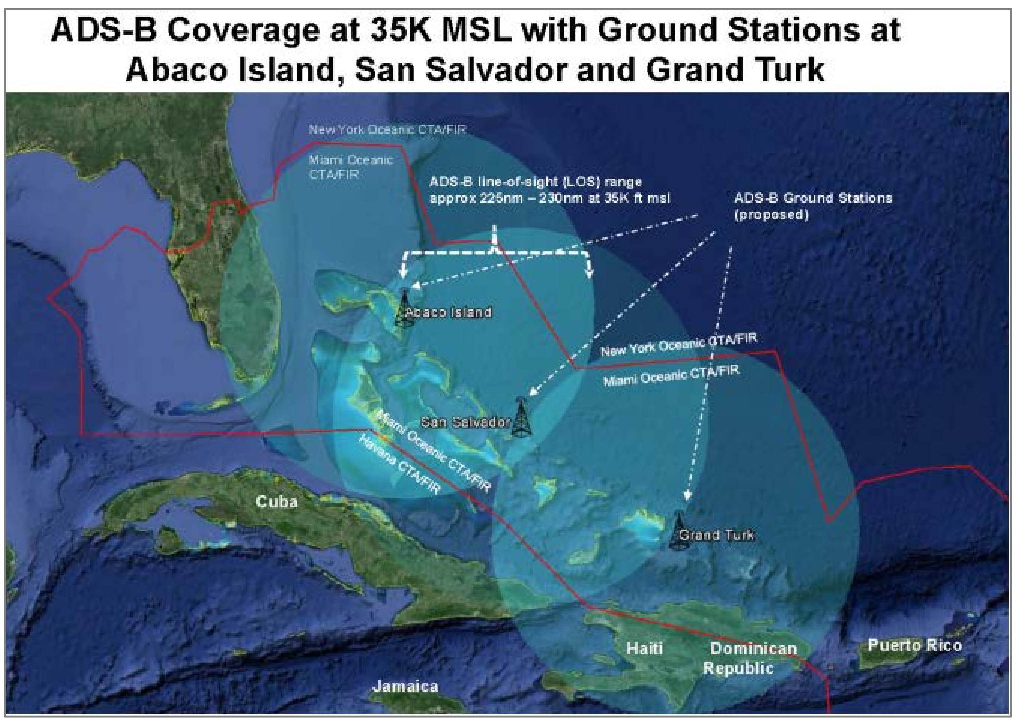
Surveillance

By improving or adding surveillance in the Caribbean, controllers can make use of more efficient separation or routes for aircraft. There are two primary challenges today with respect to surveillance. As noted above, single points of failure such as Grand Turk radar drive significant reroutes and delay when they are out of service. Hence, backup or redundancy surveillance is important to maintain efficiency. In addition, current surveillance restricts traffic between ZMA and ZSU into a funnel shaped area north(west?) of ZSU defined by the radar coverage overlap between the two facilities (also noted earlier). Expanded surveillance coverage may increase the size of the airspace where radar separation could be utilized. The widening of the funnel will allow for additional routes to be utilized through that area thus increasing capacity.

Implement ADS-B in the Caribbean

The addition of Automatic Dependent Surveillance – Broadcast (ADS-B) ground stations in this area will improve the areas of coverage and provide needed redundancy. The diagram below from the FAA Surveillance and Broadcast Services (SBS) Program Office depicts three potential ADS-B ground station sites in the Caribbean at Abaco Island, San Salvador and Grand Turk. Note the potential increased reach of the surveillance beyond the northern borders of ZMA.

Figure 24 Potential ADS-B Coverage in the Caribbean

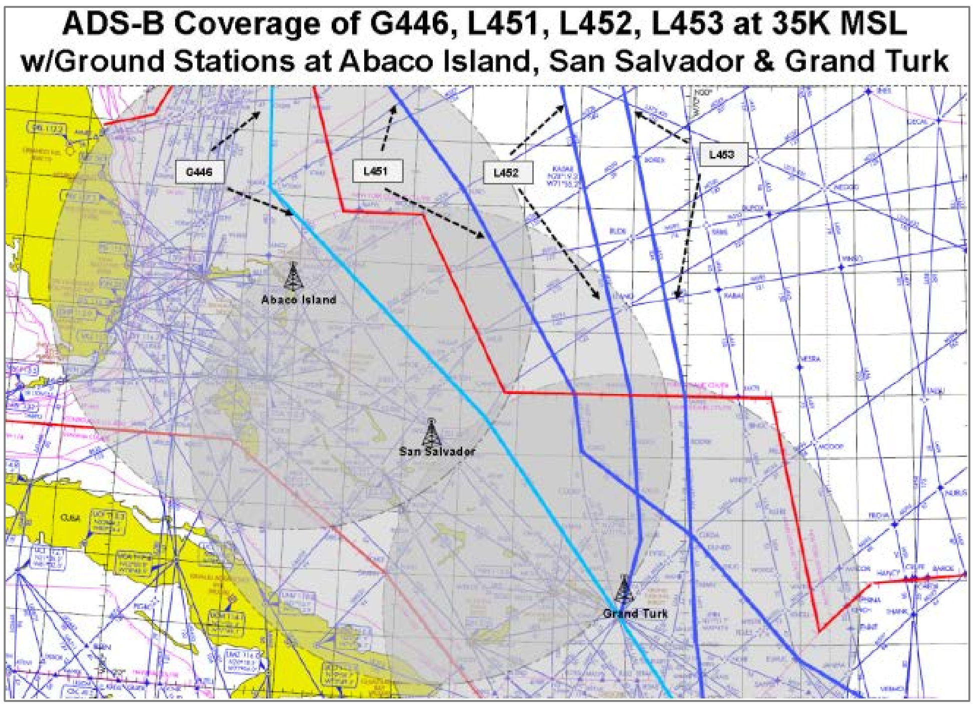


Source: FAA Surveillance and Broadcast Systems (SBS) Office

There are meaningful potential benefits from ADS-B in the Caribbean. First, when Grand Turk radar is out of service (seven times in 2014), flight operators experience $2-3 million in extra fuel costs along with increased levels of delay and cancellation. ADS-B's surveillance redundancy would allow appropriately equipped aircraft to operate on traditional routes even without Grand Turk radar in service. While the ADS-B mandate is not until 2020, some operators already have equipped aircraft and the rest expect to have equipped aircraft begin to enter their fleet in the next 2-3 years. During the 2017-2020 time frame, ADS-B capability in the Caribbean will offer operational benefits and may motivate flight operators to accelerate equipage and allocate ADS-B equipped aircraft to the region.

There will also be new opportunities for radar separated routes. The following diagram depicts some current routes in the Caribbean including Lima route 451. Note that L451 is wholly contained by potential ADS-B coverage. Additionally, L452 enters potential ADS-B covered airspace earlier than it enters ZMA's radar airspace today. There are concepts to evolve to ADS-B routes with radar-like separations and/or to implement additional parallel routes.

Figure 25 Relationship of Existing Caribbean Routes and Potential ADS-B Coverage



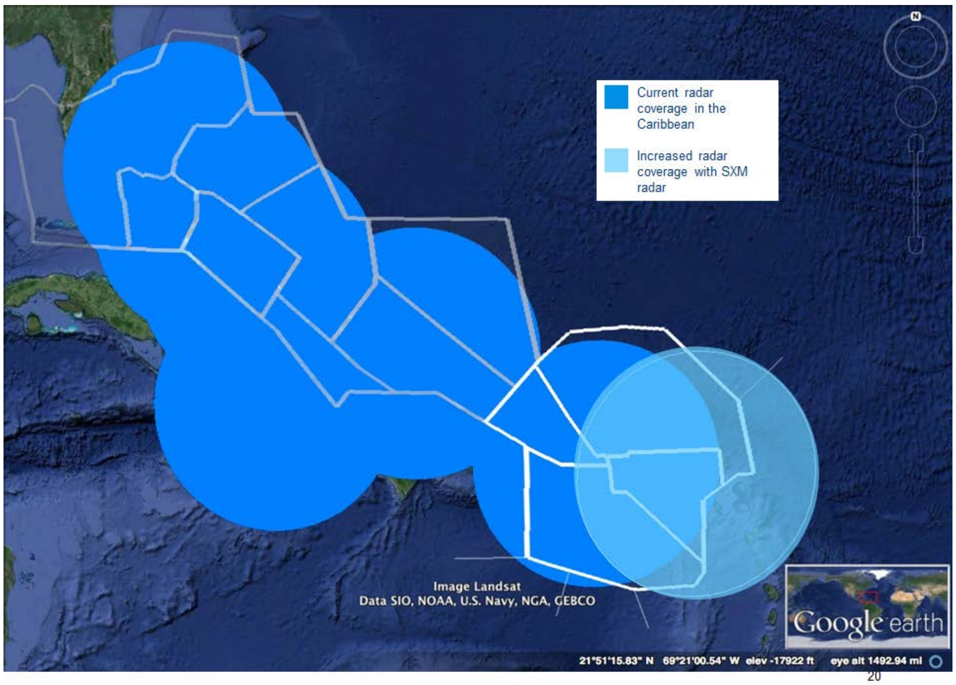
Source: FAA Surveillance and Broadcast Systems (SBS) Office

In addition to ground-based ADS-B, the ERTG considered the impact of potential space based ADS-B in the Caribbean. While space based ADS-B may have operational benefit in the future, it is an emerging technology with many technology, operational and policy questions. As such, the ERTG stands by its recommendation of implementing ground-based ADS-B in the Caribbean.

Input St. Maarten Radar Feed into the ZSU Radar Mosaic System

This option involves input of the existing SXM radar into ZSU via Fusion. The diagram below shows the additional coverage the SXM radar would offer. This will provide additional radar coverage into/out of SXM Approach as well as increasing the coverage in the Northeast portion of ZSU airspace. The SXM radar data could enable reduction of separation standards between ZSU and SXM approach to normal separation (45 NM lateral separation to 5 NM radar separation[7]). This will allow for more efficient blending of climbing and descending traffic into and out of a number of aerodromes, including Clayton J. Lloyd International Airport in Anguilla (TQPF), Princess Juliana International Airport in St. Maarten (TNCM), V.C. Bird International Airport in Antigua (TAPA), Robert L. Bradshaw International Airport in St. Kitts (TKPK), Hewanorra International Airport in St. Lucia (TLPL), Martinique Aime Cesaire International Airport (TFFF) and Pointe-a-Pitre International Airport in Guadaloupe (TFFR). This could affect approximately 150-200 flights per day.

Figure 26 Increase in Surveillance from SXM Radar



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This will require completion of draft international agreements with St. Maarten developed years ago which included an annex for radar data sharing. This agreement would be updated after this requirement is validated.

Identify and Access a Backup Option for Grand Turk Radar

Gaining access to one or more radar sites from the Dominican Republic may provide a backup to Grand Turk (GDT) radar and continuity of radar service when the GDT radar fails. There is an existing radar data sharing agreement in place with the Dominican Republic, and they have at least two radars with 240 NM range that may provide some backup coverage depending upon their current location.

[7] From 6/29/04 memorandum from Acting Air Traffic Manager, San Juan CERAP to Kip Johns, Manager Requirements Branch, Eastern Enroute and Oceanic Operations, Subject: ACTION: Request for Data from St. Martin Radar Site to be submitted to the San Juan CERAP MEARTS Radar System

Technology Improvements

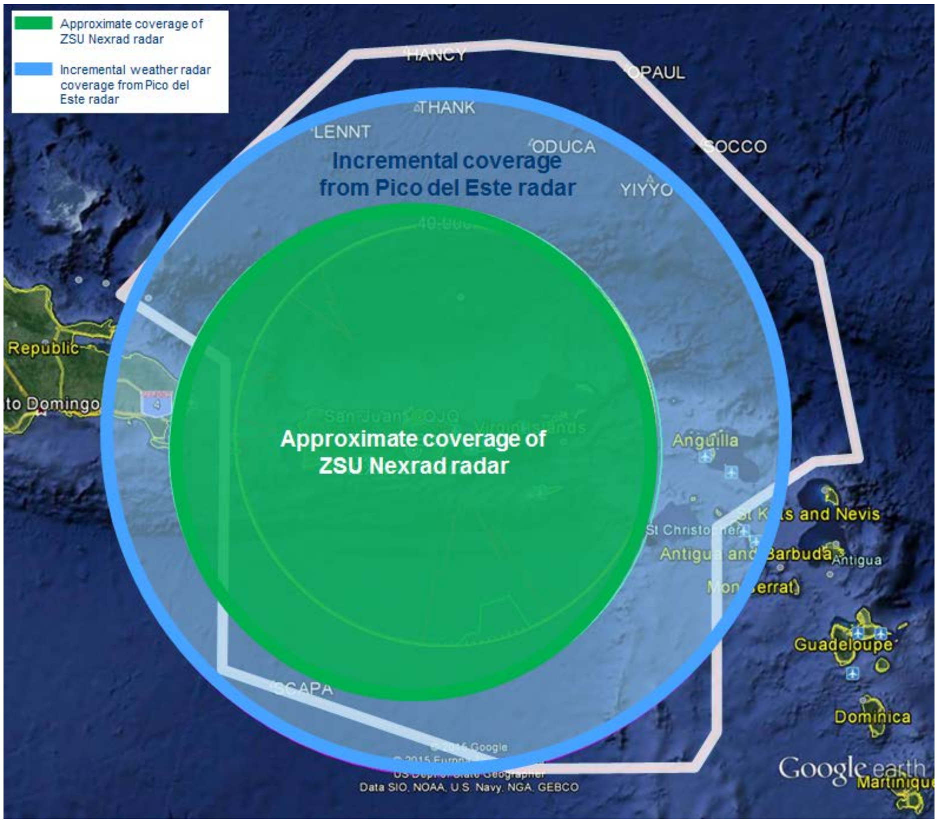
The areas and items mentioned above are the highest priority and most straight forward needs identified by the task group. They provide the greatest gains in the shortest possible timeframe. There are several other items evaluated during deliberations that also deserve serious consideration, but they are considerably more complex and will require greater resources or time. Some of these items may require their own program. They are listed below in order of priority:

Investigate Option to Access Weather Information from Long Range DoD/DHS Radars

Ultimately the objective of ATC is to provide real-time weather information “on the glass” on controller’s radar displays to the extent possible. Weather is always a consideration in flight safety and planning and ensuring safe and timely access to the available airspace. There are Long Range Radars (LRR) in the Caribbean that capture primary weather information. In 2004, the Office of Management and Budget (OMB) transitioned these LRRs from the FAA to DoD and DHS. As a result, the weather information from these radars ise no longer available to Air Traffic Services as processing of weather data can be detrimental to the high target detection capability requirement of DoD and DHS. One such LRR site (out of the 120 impacted) is Pico del Este on the Eastern side of Puerto Rico.

In the figure below, the white line represents the boundary of ZSU while the blue represents the range of the Pico del Este radar. Note that it covers nearly the entirety of ZSU and is significantly larger than the NEXRAD coverage, depicted in green. The ERTG understands there are software accommodations that may be utilized to strip off weather data for independent processing in a manner that does not impact the mission of DoD or DHS. Such data could be utilized to provide high quality weather information to air traffic controllers.

Figure 27 Weather Radar Coverage of NEXRAD and Pico del Este Radars



In 2012, the FAA decided that weather functionality on these radars would remain disabled. The ERTG recommends this be reconsidered for the Caribbean.

If the Offshore Precipitation Capability shows promise, expedite Caribbean access

In addition, a current research effort between the FAA and MIT Lincoln Labs, the Offshore Precipitation Capability (OPC), appears to have promise to offer a capability in enhancing offshore weather information. The OPC will undergo an evaluation at the Tech Center during 2015. Should the results from this testing be promising, the ERTG recommends accelerating movement of OPC out to the field. Strong consideration should be given to deploying the capability as a demonstration program in the Caribbean. Generally, speaking any research involving offshore weather should consider ZMA and ZSU as logical targets for partnering and testing new products or information.

Enable ZSU to Participate in Data Comm

As noted earlier, ZSU is not currently on the Waterfall schedule for Data Comm. With the communication gaps inherent to offshore airspace, Data Comm could serve as an important communication backup to controllers struggling to make contact with aircraft inbound to the region.

Make Caribbean Radar Presentations Available to ZNY

Through use of emerging IP protocols, there is opportunity for ZNY Oceanic sectors to ingest 1 or 2 Caribbean radars for situational awareness. Due to the IP protocol approach, such information could not be utilized for separation. However, even such situational awareness would be of value to ZNY Oceanic controllers to have the "heads up" about aircraft that are coming into the Center via manual coordination. The Tech Center has already connected this information in its research facilities, and ZNY personnel have seen what the IP-based display of Caribbean radars would look like. ZNY's first choices would be to access Freeport, Grand Turk and Saint Maarten radars.

Airspace Priorities

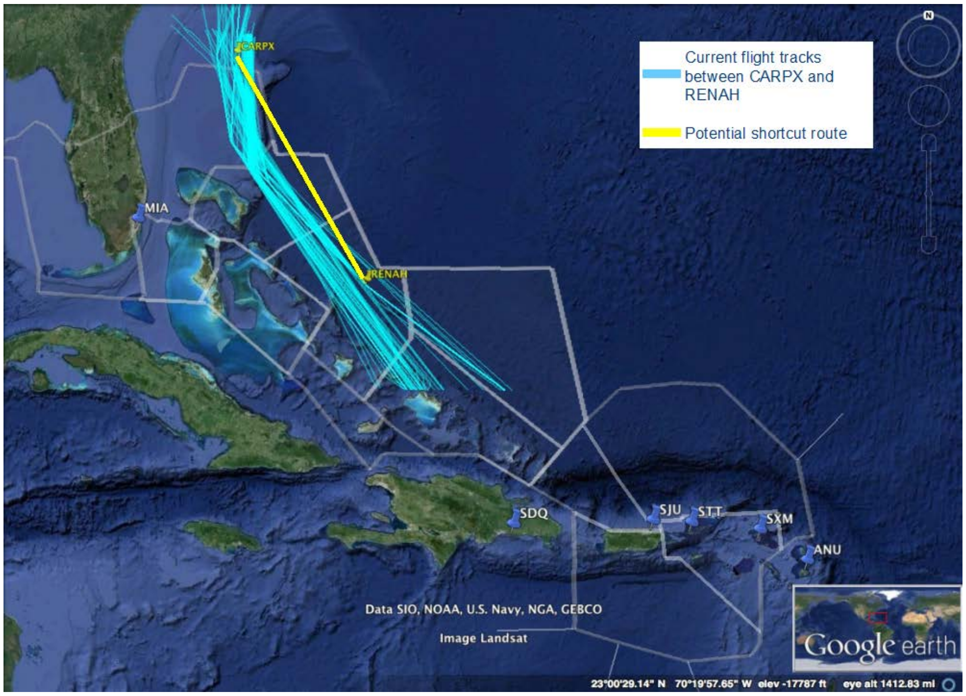
Explore Options to Reduce Separation between ZNY and ZSU/ZMA

With the existing precedent set between Oakland (ZOA), Seattle (ZSE) and Anchorage (ZAN) Centers regarding the transfer of aircraft into and out of Oceanic airspace using Oceanic reduced separation standards available to suitably equipped aircraft, we believe there are opportunities to follow this example in this region. Current Interfacility procedures require ZNY oceanic to transfer aircraft into ZMA and ZSU airspace using traditional oceanic separation of ten minutes (80NM) longitudinal separation between all aircraft at the same flight level. The advanced automation platform used by ATOP allows for ZNY to apply distance based longitudinal separation of 30NM for RNP-4 aircraft, and 50NM for RNP-10 aircraft. Since 98 percent of all aircraft that operate in the ZNY Oceanic West airspace are RNP-10 equipped, there is an opportunity to be able to transfer aircraft between facilities using the 50NM reduced standard, provided that appropriate surveillance and communications are available at the common boundary. In this way, FAA can apply best equipped/best served applications of separation, enhance the flight routings of approximately 350 flights per day based on today's volume and schedules, make available more efficient altitudes for other flights, increase capacity, and reduce the amount of holding prior to transfer due to a lack of available altitudes. There are some opportunities now available with the integration of the Freeport (ZFP) radar into ZMA that will be explored, and with future enhancements to integrate the Saint Maarten (PJM) radar and frequency into ZSU, other opportunities will become available. The three facilities have committed to continue the research, and begin aligning procedures to explore all possible options in this area, but will need the support of FAA to provide some level of funding for travel and potential overtime to expedite the process.

Implement a Shortcut Route between CARPX and RENAH

After research and analysis between the FAA and NAS users regarding routings in this area, there is benefit to both the FAA and NAS, by shortening the G446 routing by going CARPX direct to RENAH rather than the present routing required today. This shortcut is depicted below:

Figure 28 Potential Shortcut Route in ZMA



This will increase airspace capacity and efficiency by making the route shorter and more desirable to other operators. This change would affect approximately 100 flights a day based on today's flight schedule and usage. The savings in dollars is expected to be between $8-10 million dollars annually in direct operating costs to the NAS users. This would benefit the FAA by making this route more desirable and having the option for offloads and decrease in saturation of other routings. All stakeholders agree this option is a "win-win" for all involved and initial progress on this should continue.

This will require a boundary change between ZMA and ZNY as well as a test and analysis of the communications within this area of airspace and will have to go to Spectrum Engineering to be evaluated. Additionally, for this route to be offered at all altitudes, the Abaco Island frequency referenced earlier would be a requirement. Until this frequency is made available, the shortcut could be offered at higher altitudes using existing communications, if possible. There is a possibility that this task could be completed with a minimal amount of funding. The required resources for this to become a reality will be overtime and travel costs.

Conduct an Integrated Redesign of ZMA and ZSU Airspace

Airspace structure in the Caribbean received extensive attention during ERTG discussions. Both airspaces require a significant redesign effort as both have undergone changes since their original design, including extensive growth and closing of the Navy Base in Puerto Rico. To ensure safety in the current airspace structure and traffic demand, TMIs are regularly utilized to meter the flow. This sacrifices efficiency and points to the fact that capacity in the region's airspace structure as currently defined is completely utilized, particularly on peak operational days. In the FY15 winter season (128 days) approximately 50 days included TMI's of which 23 days had AFP's initiated out of a total 120 FY15 operational winter days.

Airspace issues in the Caribbean range from safety concerns to overloaded sectors to imbalance between neighboring sectors to a lack of structure. All of these issues are understood as high priority at the facility level and multiple offices within the FAA area already examining the issues.

In ZMA, continuation of work to address safety concerns in Sector 40 is required along with analysis of the large oceanic sectors to consider lateral and/or vertical development. In ZSU, a complete overhaul is required to redesign away from the current sector structure designed around warning areas that are now retired as well as to instill structure to segregate traffic streams. The route structure could include overflight routes as well as SIDs and STARs.

Redesign of ZMA and ZSU needs to be one macro effort, or, at a minimum, closely linked. Airspace at both oceanic and approach control functions would have to be redesigned to complement the new traffic flows. Additionally, a redesign would require linkage to the South Florida Metroplex and any international endeavors with neighboring or underlying foreign faciltiies. This redesign effort will increase safety, help decrease controller workload, and increase capacity and efficiency. The FAA and NAS users all benefit with the redesign.

Discussions are already taking place between ZMA, ZSU, the Eastern Service Area and FAA Headquarters to redesign Caribbean airspace. This effort will require resources for airspace study and design teams as well as implementation that may include new supporting infrastructure or establishment of new physical sectors in ZMA or ZSU. In addition to the state of the current sectors, additional ADS-B coverage would allow for this area of airspace to expand the width of this narrow corridor and consume non radar airspace thus creating more opportunities to improve through put.

Improve Short Term Cuba Access in the Giron Corridor

In current operations, there is a need to develop dual north and south airways in and out of Cuban airspace in the Giron Corridor between ZMA and Havana. The airspace available for transition between Miami ARTCC and the Havana ACC in the Giron corridor is limited. Due to this limitation, the airway structure does not allow for procedural separation of aircraft. Aircraft must transition north and southbound along the same route, creating built in conflicts between climbing and descending traffic. These conflicts are "hot spots" that require attention, increase workload and introduce unnecessary risk to the operation. There have been incidents in this area including loss of separation in recent years.

The dual route structure between ZMA and Havana ACC could be created with the addition of a minimal amount of airspace. This would have safety benefits but also improve efficiency as traffic flow restrictions should diminish and the overall ability to accommodate peak demand should improve.

This option should be further researched and analyzed. Looking at the present day flight schedule and usage, approximately 125 flights traverse this corridor on a daily basis and is only anticipated to grow with easing of US/Cuba relations. This is being reviewed in ZMA within the Metroplex design.

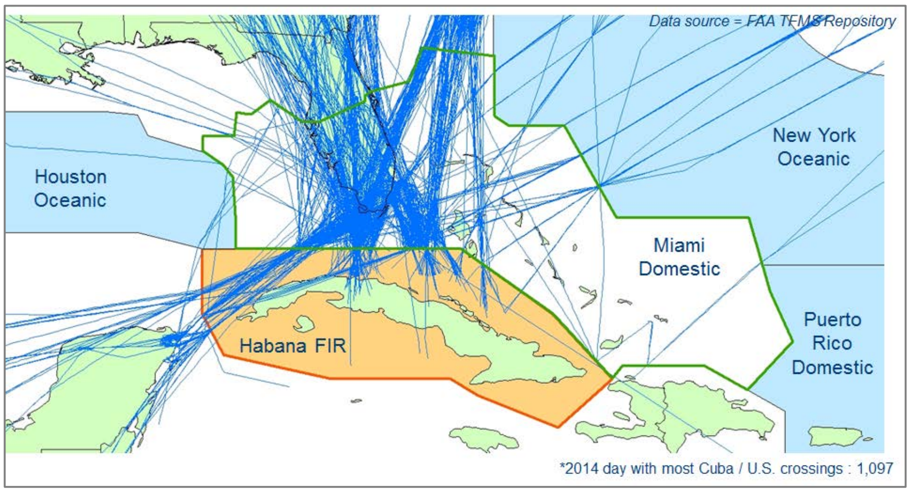
Prepare for Significant Growth in Cuba Operations

Beyond the specific Giron corridor, the easing of relations between the US and Cuba is expected to experience growth of traffic operations through ZMA Oceanic. From 2012 to 2014, there were approximately 22,500 annual operatoins between Cuba and non-US airports. A sample of non-Cuba

Caribbean airports suggests that flights from US airports typically comparise about two-thirds of Caribbean traffic. If this ratio holds in a mature US-Cuba market, operations to and from Cuba would grow to about 70,000 annual operations. This would represent an increase of 40,000 annual operations from today, most of which would traverse ZMA Oceanic airspace. This airspace handled approximately 511,000 aircarft during CY2014 implying that Cuba growth on its own could increase ZMA's traffic by 8%.

The diagram below, drawn from the FAA's April 2015 briefing to the ZMA Customer Forum, depicts current flights crossing the Cuba/US boundary. This diagram underscores the fact that Cuba growth is clearly tied to ZMA and could place further demand on Sector 40.

Figure 29 Flights Crossing Cuba/US Boundary on December 27, 2014



Source: Florida/Caribbean Customer Forum, International Office Updates – Cuba, April 29, 2015

Dialogue is ongoing between US and Cuban facilities on his topic. The ERTG stresses that flight operators are actively preparing to operate scheduled service to Cuba and preparation for this anticipated growth should be deemed a critical priority for the region.

Harmonization in the Region

Finally, the ERTG makes a series of recommendations to ensure harmonization of its recommendations with other efforts in the region. There are multiple efforts underway to improve operations and safety in the Caribbean, both within the FAA as well as with international entities. In addition to the ERTG's efforts in the Caribbean, some other activities include the South Florida Metroplex, ZMA's efforts to address R40, the ICAO North American, Central American and Caribbean Office (NACC) effort, PBN efforts by Trinidad and Tobago (Piarco), etc.

FAA should establish one body to develop an integrated plan and lead implementation in the Caribbean

Throughout the course of the Eastern Regional Task Group's work, subject matter experts from many areas of the FAA engaged with the ERTG. Experts came from the operational facilities, the Eastern Service Center, multiple organizations within headquarters and the Technical Center. The broad FAA participation on this effort underscores the fact that an FAA team across different lines of business will also need to collaborate on implementation. Leadership of this cross-functional effort will be critical. The Committee recommends the FAA establish a single point of leadership within the agency, in collaboration with Labor and Industry, to develop an integrated plan and lead implementation. The leadership of this initiative will need to maintain active coordination within the FAA to ensure harmonization with other efforts as well as priority of the solutions for the Caribbean.

When possible, the FAA should strive to utilize the same personnel across the implementation to ensure consistency. When this is not feasible, targeted face-to-face interactions between parallel teams are recommended to build appropriate relationships and coordination.

Industry should continue to be engaged in the Caribbean Air Traffic Improvement Initiative: going forward, the TOC should continue to stay abreast of the status of these recommendations, aid in collaboration and implementation of priority recommendations and ensure all parties remain aware of planned changes. The Eastern Regional Task Group (ERTG) has already convened a wide cross section of stakeholders in the Caribbean operation and would be a logical group to continue overseeing these recommendations as one aspect of its ongoing business

Maintain Active Coordination with ICAO's North America, Central America and Caribbean Office

To ensure alignment, FAA implementation leadership and the affiliated industry working group must remain synchronized with any other activities that are impacting the region. With ICAO, implementation must synchronize with the work of the ICAO NACC activities which include efforts in PBN route development, radar data sharing, exchange of flight plan data and ATFM.

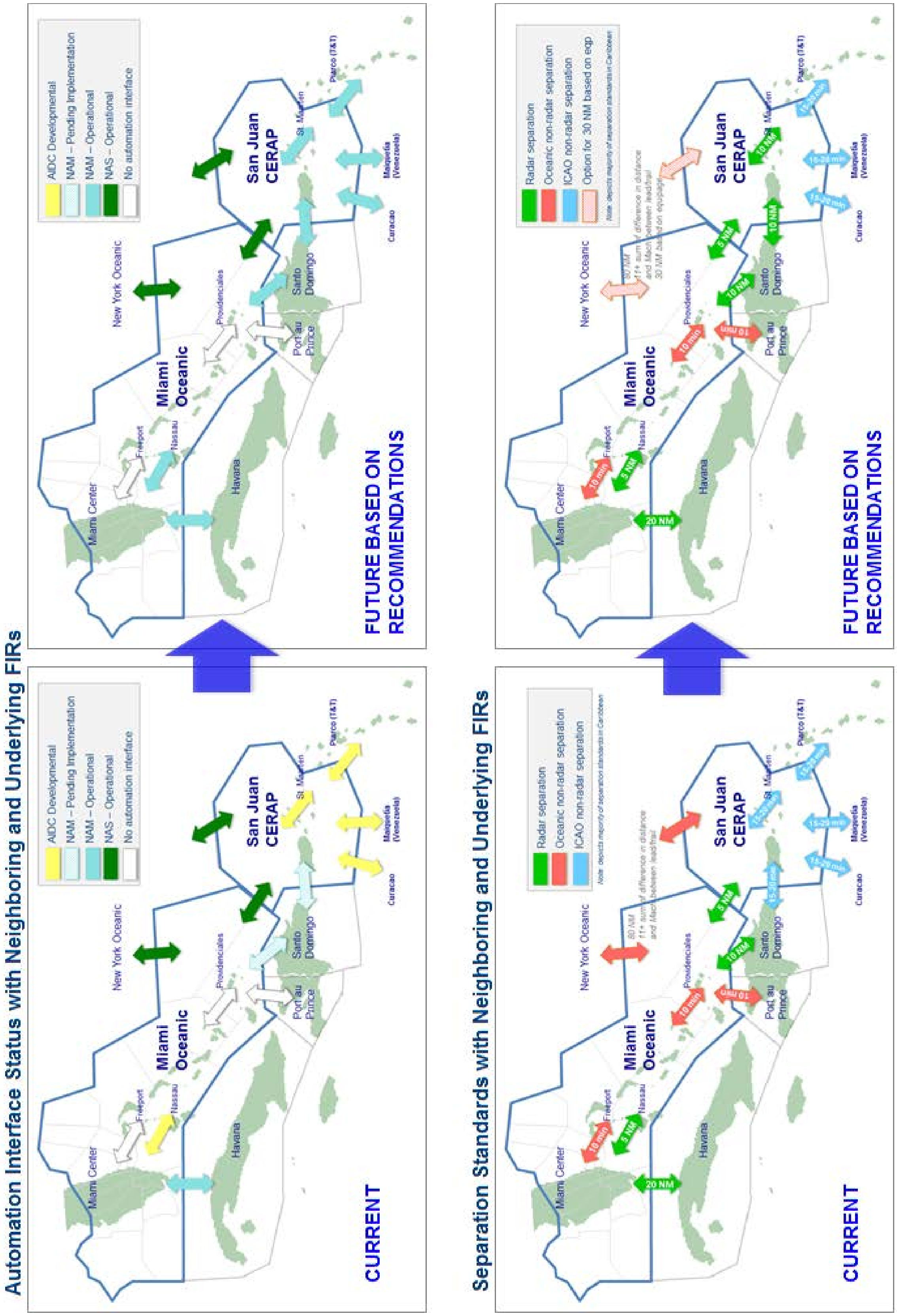
Ensure Active Involvement of the Office of International Affairs, Western Hemisphere Office

Keeping the Office of International Affairs involved in the ongoing implementation will be critical to activities that might have international implications. This applies to many of the infrastructure recommendations discussed above. IATA has also expressed a willingness to support the FAA in any international facilitation.

Summary and Impact of Recommendations

Category		Recommendation
Infrastructure Priorities	Communications	Implement a New Communications Frequency at Saint Maarten
		Implement a New Communications Frequency at Abaco Island
		Install Dedicated Shout Lines with Certain Adjacent or Underlying International Facilities
	Automation	Regional Implementation of Automation: 1. Continue implementation of ADE with Santo Domingo 2. Develop software translation for neighboring facilities with AIDC protocol 3. Ensure ERAM software upgrades associated with ADE stay on schedule
		Implement Independent Flight Data Processing in ZSU
	Surveillance	Implement ADS-B in the Caribbean
		Input St. Maarten Radar into the ZSU Radar Mosaic System
		Identify and Access a Backup Option for Grand Turk Backup
	Technology Improvements	Investigate Option to Access Weather Information from Long Range DoD/DHS Radars
		If the Offshore Precipitation Capability shows promise, expedite Caribbean access
		Enable ZSU to Participate in Data Comm
		Make Caribbean Radar Presentations Available to ZNY
Airspace Priorities		Explore Options to Reduce Separation between ZNY and ZSU/ZMA
		Implement a Shortcut Route between CARPX and RENAH
		Conduct an Integrated Redesign of ZMA and ZSU Airspace
		Improve Short Term Cuba Access in the Giron Corridor
		Prepare for Significant Growth in Cuba Operations
Harmonization		FAA should establish one body to develop an integrated plan and lead implementation in the Caribbean
		Maintain Active Coordination with ICAO's North America, Central America and Caribbean Office
		Ensure Active Involvement of the Office of International Affairs, Western Hemisphere Office

Figure 30 Impact of Recommendations on Automation Interfaces and Separation Standards



Appendix A: Detailed Assessment of Operational Needs

OPERATIONAL NEEDS TO ADDRESS CARIBBEAN OPERATIONS

Note: any cost estimates below are purely order of magnitude estimates; actual costs may differ greatly from these estimates based on a variety of variables including cost of software development, equipment, access, communication lines, etc.

Num	Option	What it is	Status	Operational Impact	Value	Timing	Cost	Risk	NAP Entry
INFRASTRUCTURE OPTIONS									
1	SXM Frequency	A new frequency that extends ZSU's comm reach in the Northeast Oceanic quadrant of ZSU. ZSU does not have a frequency for SXM today. The frequency used not certified to reach SXM and any comm beyond certified service volume is additional benefit when available.	Existing radios will need to be upgraded to Nexcomm radios with connectivity (meva3). Have draft international agreements with St Maartin from several years ago for Air Navigation Services and an annex for radar data sharing. Also very rough draft of 2nd annex for establishing an FAA-owned air-to-ground radio site (RCAG) in/on the ATCT in St. Maarten. Agreements require updating after requirements validated and funded.	Currently, comm gaps in NE of ZSU may affect approximately 120 flights per day. Result is difficulty to communicate with aircraft and/or multiple attempts to make contact. ZSU SMEs estimate 15% of aircraft require multiple transmissions.	**Controller Workload & Safety** Frequency ensures consistent communication between pilots and controllers resulting in safer operation. **Redundancy** The current frequency is out of service approximately 6-7 times per year.	**1-3 yrs after funding in place**	**$350K ROM** Funding streams exist for comm; this equipment needs to go into this funding database; requires dedicated line		2014-1931
2	Abaco Island frequency	New frequency in Northern Bahamas	No work done to date. No existing formal international agreement for FAA-owned facilities in the Bahamas.	Improves comm with low altitude aircraft in northern Bahamas Covers gaps on ZNY-ZMA boundary Improves comm for shortcut route and potential ADS-B coverage area	**Controller Workload & Safety** Improved comm with operating aircraft **Capacity/Efficiency** Prepares for changes from shortcut or ADS-B			Negotiations between US and Bahamian governments	
3	SHOUT LINES: **TUPJ** (BI Tower, Tortola, USVI), **TTZP** (Piarco ACC, T&T), **SVZM** (Maiquetia ACC, Venezuela), & **TNCF** (Curacao ACC, Curacao, Kgdm of Neth)	A direct line between facilities for a Controller to "shout" to another facility without dialing or waiting for other end to pick up	All locations will require site surveys and identification of needs, some need NAP. Requires connectivity from ZSU and multiple locations.	Wait time to reach appropriate controller in other facility versus immediate "shout" to coordinate. TTZP affects 170 flights per day. SVMI 27 per day. TNCC 12 per day. First two priorities are MDPC and TTZP	**Controller Workload & Safety** Saves controller time and attention from dialing/waiting; may be used to look at scope instead **Capacity/Efficiency** Controllers more focused on traffic and can provide improved service	**1-3 yrs after funding in place**	**$???** Includes initial acquisition and ongoing maintenance		2015-6116, 2015-6117,2015-6115, 2013-2117, 2013-2116, 2013-2115, 2013-2122-
4	ADE with MDCS, TNCC, SVMI, TTZP and underlying facilities	ZMA/ZSU handoffs with foreign facilities are manual, except for Cuba. This takes time for controller to establish comm with adjacent facility and exchange flight plan and crossing info. ADE eventually leads to seamless transition of aircraft and comes in three phases: 1) ADE provide flight plan, position, time information 2) Provide flight plan changes 3) Automated handoffs	Pursuing Class 1 ADE with Santo Domingo. Thales/DR system vendor making some software changes. For ZSU-MDSD, preliminary adaptation done. Testing after Thales upgrades will determine compatibility. ICAO AIDC Interface GoTeams Site Assist visits only conducted for the DR and Honduras. ADE with AIDC protocol neighbors (Curacao, SXM, Piarco, Maiqueta) requires interface translator to be developed with ERAM.	<u>Daily, this affects:</u> 400+ flights ZMA-MDSD 86 flights ZSU-MDSD 170 flights ZSU-TTZP 27 flights ZSU-SVMI 12 flights ZSU-TNCC <u>Assuming 1 min saving of controller time per flight with ADE, this frees up:</u> 6 hrs for ZMA-MDSD 1.5 hrs for ZSU-MDSD 3 hrs for ZSU-TTZP	**Controller Workload & Safety** Controller time reallocated from manual coordination to time available to control, monitor, etc.	**18-24 mos** (best case)	**$TBD** Normal cost of doing business; requires personnel time and/or overtime for working interfaces (HQ) and adaptation, configuration and training (Facility)	**Software changes** None anticipated. But if any are uncovered, may required additional software development funding.	2015-3850
5	Improved Real-Time Weather Information for Controllers	Improved weather information for controllers on the glass, either through access to LRR Wx data or new Wx sources like OPC	Current NEXRAD Weather radar in ZSU is slow to update (5-13 minute refresh) and has a blind-spot bearing 280 from SJU. The lag is larger with more weather. Also, lost access to LRRs with weather info.	Consistency between what pilot and controller sees. Inconsistency increases comm to reach resolution. Also better info earlier allows for less drastic route changes.	**Controller Workload & Safety** Alignment of controller/pilot Wx info during bad weather scenarios makes for safer operation	**Extended**			

OPERATIONAL NEEDS TO ADDRESS CARIBBEAN OPERATIONS

Note: any cost estimates below are purely order of magnitude estimates; actual costs may differ greatly from these estimates based on a variety of variables including cost of software development, equipment, access, communication lines, etc.

Num	Option	What it is	Status	Operational Impact	Value	Timing	Cost	Risk	NAP Entry
6	ADS-B in Caribbean	Have approximately 3 ADS-B ground stations on foreign soil in the Caribbean to provide coverage between domestic ZMA and ZSU	ADS-B in Caribbean under consideration in the SBS Office.	Currently radar-covered airspace between ZMA and ZSU is a funnel and restricted to the North by reach of radar coverage. ADS-B extends the size of this funnel to the North.	**Capacity/Efficiency** > ~$3M extra DOC when GDT OTS; add'l costs upline delay and CX > New radar sep routes, opp'y for L451 to be covered by ADS-B > May provide routing option for eqp'd aircraft in 17-19 timeframe **Redundancy** Between now and 2020, provide surveillance backup	**2.8 yrs**	**$3.5M**		
7	Independent Flight Data processing in ZSU	FDP in ZSU and no longer reliant upon ZAM for FDP	None. No work to date on this beyond initial discussion with technical experts.	Enables ZSU to become independent of ZMA in FDP which helps enable changes to airspace, sector design, etc. Also removes risk of reliance on ZMA. Finally, enables new functionality like route readout, flight plan readout, input of amendments on the glass, etc.	**Controller Workload & Safety** Reduces work of A side controller, improving overall "heads up" time for controller team **Capacity/Efficiency** Improved management of air traffic on the glass improves service to operators		**$3-4 M**		
8	Datacomm	ZSU Participate in Datacomm Deployment	None for ZSU. Pre-departure reroutes via Datacom end of 2016. Airborne reroutes in 2018/2019. Dependent upon ERAM; right now only for 20 contiguous Centers.	Alternative mechanism to establish comm Provide airborne reroutes that adjust for weather and/or volume	**Controller Workload & Safety** Reliable method to establish comm and adjust routes for safety **Capacity/Efficiency** Improved efficiency of routing operating in the Caribbean				
9	SXM Radar	Fuse SXM radar into ZSU's surveillance data	Have draft international agreements with St Maartin from several years ago for Air Navigation Services and an annex for radar data sharing. Agreements require updating after requirements validated and funded. Will also require further investigation on how to provide connectivity between ZSU and SXM.	Provide additional radar coverage in/out of Juliana Approach as well as in NE portion of ZSU. Radar coverage provides a more efficient service for climbing and descending oceanic traffic in and out of TQPF, TNCM, TAPA, TKPK, TDPD, TLPL, TFFF, and TFFR. Estimate affects about 150-200 flights per day.	**Capacity/Efficiency** More efficient service for climbing and descending oceanic traffic in and out of Juliana approach airports		**$650K ROM**		2014-1928
10	Grand Turk Backup	Access to radar that serves as surveillance backup when Grand Turk goes out of service	Have radar sharing agreement in place with DR. Still need to identify the appropriate radar, likely in the DR.	Provides continuity of surveillance coverage even without GDT radar.	**Redundancy** Provides partial backup to GDT radar	**18 mos**	**~$1M**		
11	Make Caribbean radars available to ZNY	IP-based integration of Caribbean radars to ZNY Oceanic surveillance.	ATOP Work Package 1 bringing more data in via IP protocol. Current ATOP limit of 6 surveillance sources can be overcome with IP.	Integration into ATOP protects vs errors in timing, altitude by feeding radar to conformance monitoring system. If ADS-B ground stations available, would integrate into ATOP as well.	**Controller Workload & Safety** Improved controller Situational Awareness of oceanic traffic	**After data storage capacity increase ~2018**		**Will IP protocol be approved for controlling traffic?**	

OPERATIONAL NEEDS TO ADDRESS CARIBBEAN OPERATIONS

Note: any cost estimates below are purely order of magnitude estimates; actual costs may differ greatly from these estimates based on a variety of variables including cost of software development, equipment, access, communication lines, etc.

Num	Option	What it is	Status	Operational Impact	Value	Timing	Cost	Risk	NAP Entry
AIRSPACE OPTIONS									
1	Reduce Separation between ZNY and ZSU	Implementation of reduced separation from current 80 nm down to 20-30 nm separations on ZNY-ZSU handoffs.	ZSU continuing to research what is required to accomplish reduced separation. Precedent exists between ZOA and ZNC.	Affects 350 flights per day transitioning between ZNY and ZSU. More efficient altitudes will become available. Some reduced holding prior to handoff.	**Capacity/Efficiency** More efficienct altitude and reduced holding. Estimate $600 per flight savings for narrow body accessing FL370 vs FL330. If 10% of daily flights improve altitude, saves $7.5 million.	**Ongoing** **~2 yr project**	**Cost Doing Business** Personnel, OT, travel	**Access to OT or Travel Funds**	
2	Shortcut route	Short cut G446 route, CARPX direct RENAH.	Still requires test on communication; will have to go through Spectrum engineering. Could be "fasttracked" with minimal amount of funds.	Approximately 60-70 flights a day may take shortcut route.	**Capacity/Efficiency** Saves $6-8 million annually in DOC	**Ongoing** **~1 yr project**	**Cost Doing Business** Personnel, OT, travel	**Access to OT or Travel Funds**	
3	ZMA/ZSU Airspace Redesign	Airspace redesign effort for the combined ZMA Oceanic and ZSU airspaces. Expect to follow an accelerated National Airspace Redesign (NAR) process.	Airspace between CONUS and SJU out of date and in need of redesign. ZMA Oceanic sectors large, laterally and vertically. ZSU design based on closed Navy base and little structure. ZMA R40 area of NTSB interest. Map values of sectors 58/60/62/63 may exceed 30. Neighboring airspace are being reworked - S Florida Metroplex and Piarco. In discussion already with ZMA, ZSU and Eastern Service Center.	During FY15 Winter season, approx. 50 days with TMIs and 23 days with AFPs out of 120 total.	**Controller Workload & Safety** Alignment of airspace and traffic demand and patterns will improve safety and workload **Capacity/Efficiency** Improving airspace design to yield improved and increased throughput in the region	**Ongoing**	**~$1M** For initial airspace analysis		
4	Giron Corridor	Develop dual north/south airways in/out of Cuban airspace.	Being worked in ZMA and Metroplex. Working through differences between US/Cuba separations on RNAV routes.	Currently about 125 flights traverse this corridor daily. Will become much higher priority if/when Cuba relations open up further.	**Controller Workload & Safety** Increase narrow airspace for controllors to manage Giron flow **Capacity/Efficiency** Allows more routes for aircraft to efficiency access Cuban airspace			**Possible resistance from DoD**	

Appendix B: Members of the Eastern Regional Task Group

Mark Cato, Air Line Pilots Association
JP Lazo, Air Line Pilots Association
Melissa McCaffrey, Aircraft Owners and Pilots Association
Brian Gonzalez, American Airlines, Inc.
Toby Miller, American Airlines, Inc.
Michael O'Brien, American Airlines, Inc.
Tim Stull, American Airlines, Inc.
Rico Short, Beacon Management Group
Rob Goldman, Delta Air Lines, Inc.
Mark Hopkins, Delta Air Lines, Inc.
David Houck, Delta Air Lines, Inc.
Bob Oberstar, Delta Air Lines, Inc.
David Vogt, Delta Air Lines, Inc.
Doug Arbuckle, Federal Aviation Administration
Mike Artist, Federal Aviation Administration
Christopher Barks, Federal Aviation Administration
Krista Berquist, Federal Aviation Administration
Charles Blackwell, Federal Aviation Administration
LaGretta Bowser, Federal Aviation Administration
Jorge Chades, Federal Aviation Administration
Raul Chong, Federal Aviation Administration
Janice Deak, Federal Aviation Administration
Dan Eaves, Federal Aviation Administration
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Kimberly Fowler, Federal Aviation Administration
Josue Gonzalez, Federal Aviation Administration
Geoffrey Lelliott, Federal Aviation Administration
Curtis Lineberry, Federal Aviation Administration
Paul Lore, Federal Aviation Administration
Robert Novia, Federal Aviation Administration
Mark Palazzo, Federal Aviation Administration
Mike Polchert, Federal Aviation Administration
Leo Prusak, Federal Aviation Administration
Joe Rather, Federal Aviation Administration
Mike Richardson, Federal Aviation Administration
Ed Rodgriguez, Federal Aviation Administration
John Vinyard, Federal Aviation Administration
Madison Walton, Federal Aviation Administration
Jim Webb, Federal Aviation Administration
Dan Allen, FedEx Express
Don Dillman, FedEx Express
Phil Santos, FedEx Express
Jeffrey Miller, International Air Transport Association
Joe Bertapelle, JetBlue Airways (Co-Chair)
Joe DeVito, JetBlue Airways
Thomas Lloyd, JetBlue Airways
Woody Camp, National Air Traffic Controllers Association
John Fox, National Air Traffic Controllers Association
William L Geoghagan, National Air Traffic Controllers Association
Greg Harris, National Air Traffic Controllers Association
Dale Wright, National Air Traffic Controllers Association
Bob Lamond Jr, National Business Aviation Association
Dean Snell, National Business Aviation Association
Tom Bock, Port Authority of New York & New Jersey
Ralph Tamburro, Port Authority of New York & New Jersey
Kalyan Bala, RTCA, Inc.
Trin Mitra, RTCA, Inc.
Brandi Teel, RTCA, Inc.
Bob Everson, Southwest Airlines
Edwin Solley, Southwest Airlines
Steve Kalbaugh, The MITRE Corporation
Jeffrey Collins, U.S. Air Force
Eric Eibe, U.S. Air Force
Bill Cranor, United Airlines, Inc.
Glenn Morse, United Airlines, Inc. (Co-Chair)
Ron Renk, United Airlines, Inc.
Allan Twigg, United Airlines, Inc.
Jim Hamilton, United Parcel Service

Appendix C: FAA Tasking Letter

U.S. Department
of Transportation
Federal Aviation Administration

Mission Support Services
800 Independence Avenue, SW.
Washin
gton, DC 20591

NOV 21 2014

Ms. Margaret Jenny
President
RTCA, Inc.
1150 15th Street NW
Washington, DC 20036

Dear Ms. Jenny:

The Federal Aviation Administration (FAA) is committed to collaboratively identifying and addressing efficiency impacts to the National Airspace System (NAS). Ongoing Metroplex projects currently accomplish this with focus on the airspace and PBN procedures around the Core 30 airports in the NAS using a well-defined and understood process to address issues and make improvements. Other geographic regions may also have unmet needs since efforts to enhance the airspace and operations may be limited by national program priorities and funding. A growing area of concern is in the Caribbean. Air traffic volumes in ZMA Oceanic and ZSU have grown in recent years while the capacity of the airspace itself remains largely unchanged. Select infrastructure and procedural enhancements combined with traffic management tools like miles in trail (MIT) spacing and Airspace Flow Programs (AFPs) have squeezed as much capacity out of the existing airspace but a demand/capacity imbalance persists. Both industry and facility personnel believe no further improvements in efficiency are possible without some level of airspace and infrastructure improvements.

The Eastern Regional Task Group (RTG) of the Tactical Operations Committee (TOC) recently engaged in informational exchanges with local personnel to brainstorm the current challenges and share ideas on possible solutions. Additionally, some infrastructure improvements are already underway or planned and the Central/South Florida Metroplex project has just started the design and implementation phase as well. Also, the FAA is supporting other activities in the Caribbean such as the ICAO's project for the implementation of PBN and improved aeronautical information exchange in the region.

We believe a tasking to the TOC to provide recommendations on a comprehensive approach to address infrastructure and airspace changes in the region would benefit the NAS as a whole. We request the TOC provide recommendations on a comprehensive strategy for infrastructure and airspace changes to improve safety, efficiency, and capacity in the region. Specifically, this tasking would include recommendations in the following sub-task areas:

- The use of data to clearly define the problems, causes, and solutions to the safety, efficiency, and capacity issues in the region.
- Prioritized solutions for any infrastructure components identified as most critical to improving /enhancing operations in the region.

- Prioritized solutions for any airspace improvements or enhancements as needed.
- A review of existing or planned domestic or international activities in the region and a recommended method or mechanism to insure all the work is harmonized into a comprehensive and coherent master plan.

The FAA will still face an uphill battle in terms of funding airspace and infrastructure projects in coming years, but we believe work done to complete this tasking will provide us with much clearer information in terms of what industry sees as most valuable. This will help inform better decision-making. We will provide Subject Matter Expertise (SME) as needed. We request this task be completed by the 3rd Quarter TOC meeting in the Summer of 2015 with an interim report in February 2015.

Sincerely,

Elizabeth L. Ray
Vice President, Mission Support Services
Air Traffic Organization

Approved by the Tactical Operations Committee July 2015

GPS Adjacent Band Compatibility: Feedback on Exclusion Zones

Report of the Tactical Operations Committee in Response to Tasking from The Federal Aviation Administration

July 2015

GPS Adjacent Band Compatibility: Feedback on Exclusion Zones

Contents

Background

In January 2012, the National Space-Based Positioning, Navigation and Timing Executive Committee (PNT-EXCOM) proposed the drafting of new GPS spectrum interference standards to inform future proposals for non-space commercial uses in frequency bands adjacent to GPS. As a result, the DOT developed a GPS Adjacent-Band Compatibility (ABC) Study Plan to provide the framework for definition of the processes and assumptions that will form the basis for development of the GPS adjacent-band compatibility for GPS civil applications.[1]

In October 2014, the FAA published "GPS Adjacent-Band Compatibility Study Methodology and Assumptions." Much of the study focused on analysis methodologies, aviation GPS receiver characteristics, RFI propagation path models, basic source emission parameters and interaction scenarios. One section of the study addressed operational impacts. RTCA was asked by the FAA to review the study and address six specific questions. Three questions were technical in nature (Questions 1-3) and three operational (Questions 4-6). RTCA requested Special Committee 159, "Global Positioning System," to respond to the first three questions which were technical in nature. RTCA requested the Tactical Operations Committee (TOC) to address the last three questions that were operational in nature.

In February 2015, the Tactical Operations Committee established the GPS ABC Task Group with an objective to develop the TOC's response to the three operational questions in the GPS ABC study by July 2015. This report serves as the Tactical Operations Committee's response to Questions 4-6 of the FAA's task request.

Executive Summary

This Committee reviewed the October 2014 GPS ABC study and evaluated the aviation safety and operational impact of proposed Exclusion Zones[2], which are 500 foot cylinders around GPS adjacent band transmission towers within which GPS accuracy may be compromised. These cylinders were created by the FAA as part of its assessment of potential interference to GPS receivers that are compliant with RTCA/DO-229D. A set of operational use cases were identified for helicopter operations, unmanned aerial systems, military operations and general aviation in which safety or operational performance would be impacted by these exclusion zones. These use cases formed the foundation for responding to the three operational questions posed in the FAA's October 2014 GPS ABC Study:

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[1] FAA GPS Adjacent-Band Compatibility Study Methodology and Assumptions, FAA Spectrum Engineering Services, October 3, 2014

[2] One Committee participant, LightSquared Inc., offered an alternative and significantly smaller proposal for an exclusion zone. This alternative was not evaluated in this report. All conclusions drawn herein are only related to the proposed Exclusion Zones in the October 2014 FAA GPS ABC Study.

- The proposed Exclusion Zones have negative impacts to both flight safety and operations for multiple operational scenarios and multiple types of operators. This includes negatively impacting GPS-based TAWS/HTAWS alerts. Additionally, the exclusion zones are defined to go as low as 100 feet AGL, but there are some operational scenarios with negative impacts below 100 feet AGL.

- There is no "one-size-fits-all exclusion zone" definition of an Exclusion Zone that works everywhere in the National Airspace System (NAS). The use of radio spectrum needs to be evaluated against the different NAS use cases based on the proponent's spectrum signature and density of deployment in various environments. On a case by case basis, a particular definition of an exclusion zone may be acceptable in terms of operations and safety. The dimensions of new zones, their location and density need to relate to the specific operational scenarios and the impact on aviation safety.

- Some safety impacts and operational limitations from exclusion zones are unique to the *unmanned* nature of Unmanned Aerial Systems (UAS's). For example, geo-fencing, return to base, station keeping and elevated risk of loss of equipment are all Exclusion Zones impacts relevant to UAS with its reliance on GPS and no human within the operating vehicle to provide a visual backup.

GPS ABC Questions Posed to the TOC

At a high level, the TOC was requested to identify what the possible impacts are to aviation interests from certain assumptions made by the FAA in development of networks of ground based transmitters radiating on frequencies adjacent to the GPS band. GPS receivers on different types of airborne vehicles (commercial airplanes, general aviation airplanes, helicopters, unmanned vehicles) may be susceptible to higher strength signals in the adjacent bands. Hence, some GPS receivers may experience interference when in proximity of radiation on the GPS adjacent band.[3] Airborne vehicles may rely on GPS to determine safety of life information such as position, velocity, and position relative to obstacles or to drive flight controls. All of this suggests the critical need to identify the impacts to aviation from use of the GPS Adjacent Bands.

Specifically, the FAA posed the following three questions to the TOC:

Question	Question Text
4. Impact of Exclusion Zones on Flight Safety	(c) Are the size and aggregated density of aircraft and helicopter exclusion zones where GPS-based TAWS/HTAWS alerts cannot be assured (Appendix C, section above, and reference [4]) sufficiently

[3] It is also noted that GPS receivers may experience interference from transmitters in bands further away from GPS (Out of Band emissions) when operated in very close proximity to radio towers.

	small so as to not impact flight safety? (d) Alternatively, what TAWS/HTAWS exclusion zones parameters should be considered?
5. Operational Acceptability and Safety Implications	Comments are requested regarding the operational acceptability and safety implications for the proposed exclusions, operational limitations and safety considerations identified in Appendix C of this report and Annex A of the reference [4] report including any alternative suggestions and supporting rationale.
6. Unique Considerations for Small UAV Operations	(a) Considering the proposed fixed and rotary wing aircraft assumptions, exclusions, and limitations, are there safety impacts and operational limitations that are unique to small Unmanned Aircraft Vehicles (UAVs) operations? (b) If yes, please identify the unique operational use case scenarios and any associated safety and operational issues. (c) Propose additional assumptions and "exclusion zones" for consideration that would preclude the identified safety and operational issues (if any).

Exclusion Zones

To address the risk of GPS being unreliable in proximity of adjacent band transmissions, the GPS ABC Study proposed the construct of the Exclusion Zone. An Exclusion Zone is defined as a cylinder around a transmission tower within which GPS accuracy may be compromised. The power radiated from the transmitter would be limited such that GPS interference would not exceed a defined threshold at the exclusion zone boundary.

The October 2014 GPS ABC Study proposes the following exclusion zones:

Aircraft Type	Distance from Airport	Min Obstacle Height	Exclusion Zone
Fixed Wing	Within 7.5 nm	100 ft AGL	• Intersection of a cylinder centered on the obstacle (500' in radius and extending 100' above the top of the obstacle) and the region below the obstacle clearance surfaces (as defined by the FAA 8260 series orders) for all instrument procedures. The exclusion zone extends down to the minimum altitude where coverage would be required (see below).
Fixed Wing	Greater than 7.5 nm	200 ft AGL	• A cylinder centered on the transmitter (500' in radius and 100' above the top of the obstacle), but not above 1000' AGL (including effects of falling terrain). The exclusion zone extends

			down to the minimum altitude where coverage would be required (see below).
Helicopter	n/a	100 ft AGL	• Is the intersection of a cylinder centered on the obstacle (500' in radius and extending 100' above the obstacle) and the region below the obstacle clearance surfaces (as defined by the FAA 8260 series orders) for all instrument procedures. The exclusion zone extends down to 100' AGL.

For Fixed Wing aircraft, the following determines the minimum altitude to which the exclusion zone extends:

- Between 5000'/10000' and 7.5 NM of any airport: At and above 100' AGL
- Between 7.5 NM and 15 NM to any airport: At and above 300' AGL.
- Outside of 15 NM to any airport: At and above 500' (AGL).

Methodology

The GPS ABC Task Group conducted in-person meetings at RTCA offices in Washington, DC, to deliberate and discuss the questions posed by the FAA. The Task Group developed operational scenarios for various types of operators (helicopters, UAS's, etc.) to compile feedback on the operational and safety impacts of exclusion zones. Using these scenarios, the Task Group then compiled its answers to the three questions posed by the FAA. Additionally, the Task Group documented all assumptions it made during the course of its deliberations. Assumptions, Operational Scenarios and Response to Questions are the three sections that follow.

Assumptions and Observations

To bound the work of this effort, the GPS ABC Task Group made the following assumptions or observations about this effort.

Exclusion Zones

1. The Exclusion Zone is a construct and not a physical zone. Given the limited explanation provided by the FAA regarding the exclusion zone construct, the Task Group recognizes that the definition could easily change.
2. The Exclusion Zone does not imply that an operator "shall not" operate in the zone. Instead it implies that the zone is accessible in Visual Flight Rules (VFR) or Marginal VFR (MVFR) conditions, and the operator cannot rely on GPS within the Exclusion Zone.

3. An Exclusion Zone implies that GPS may be unreliable, similar in the National Airspace System (NAS) to when the military tests interference and publishes NOTAMs indicating "GPS Unreliable."
4. Exclusion zones do not overlap.
5. The average distance between ground transmission sites is as small as 1.45 kilometers in dense urban areas (with the average intercell distance increasing in other environments as population density decreases). With a 500 foot radius for an exclusion zone, this implies an average 3800 foot corridor with no GPS interference in the middle of the approximately 4800 feet between base stations in dense urban areas.

Notifications

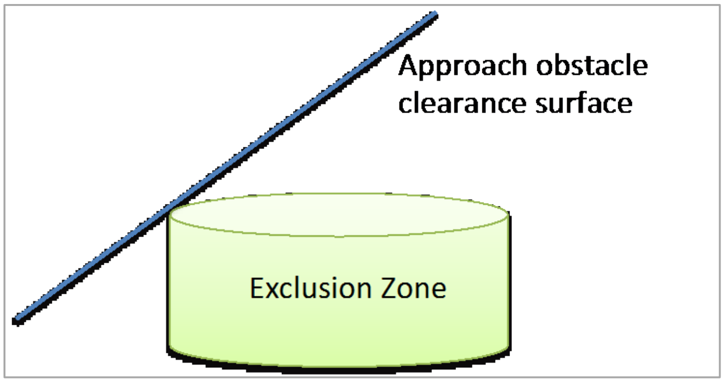
6. There is no existing mechanism to notify operators of the location of all exclusion zones where GPS will be unreliable; nor is an effective notification method anticipated to be in place in the future.
7. Exclusion zones will not be charted, either on paper or electronically, for aircraft operators.
8. Exclusion zones will not be part of Flight Management System navigation databases. Additionally, there is no guarantee that Terrain Awareness Warning System (TAWS) equipment and Helicopter TAWS (HTAWS) equipment will have an obstacle database, that an obstacle database will include exclusion zones or the frequency at which the obstacle database will be updated with respect to changes to the exclusion zones.

Ground Transmitters[4]

9. There is no planned symmetry to the grid of base stations radiating on the GPS Adjacent band.
10. The location, count and density of the transmitter sites have significant relationship to the impact on operations and safety.
11. It will be operationally impractical to attempt to deactivate specific ground transmitters.
12. Transmitters will not be installed within confines of protected airspace associated with arrivals or departures and in accordance with applicable FAA regulations. The following diagram drawn from the GPS ABC study presents a sample exclusion zone in which the exclusion zone size is adjusted to ensure it remains out of the departure or approach airspace.

[4] While out of scope of this report, it should be noted that existing infrastructure has the potential to interfere with GPS receivers.

Figure 1 Diagram of Exclusion Zone with Approach Obstacle Clearance



13. Future Instrument Procedures may require ground transmitter relocation or modification to comply with applicable FAA regulations.

14. Aggregate power for multiple transmitters will not exceed the threshold for a single exclusion zone at any point.

Aircraft

15. No change of legacy equipage on aircraft, manned or unmanned, is assumed.

16. Any emissions from any towers would be restricted to not interfere with aircraft at or above 1000 ft AGL.

17. Under current FAA GPS standards, the GPS ABC may impact ADS-B, particularly in lower altitude for which General Aviation is beginning to utilize ADS-B surveillance to aid in see and avoid operations. In addition, the FAA is starting to deploy various surface management systems at airports around the NAS that rely on accurate GPS positioning down to the surface. Additionally, after 2020, if secondary radars are decommissioned and the NAS has regions of ADS-B only surveillance, then reliance on ADS-B will only increase. Given the impacts to ADS-B are still emerging, these are noted here but not included in the operational scenarios that follow.

Operational Scenarios

Aircraft exclusion zones raise operational concerns from different types of aviation operators. The concerns range from obstacle avoidance to navigation to synchronizing position information with collaborators on the ground. The following summarizes operational scenarios for various operator types in which the Exclusion Zone concept poses an operational or safety risk.

Helicopter Operators

The helicopter community has a number of operational scenarios that would be impacted by the proposed Exclusion Zones. Helicopter operators rely on GPS for navigation, avoidance of obstacles as well for relaying positions to other units working in collaboration with helicopters. As helicopter operators tend to regularly conduct nape-of-the-earth operations, any degradation of situational awareness due to loss of GPS carries operational risk.

Emergency Medical Services (EMS)

EMS operations rely on GPS in a number of ways. Personnel on the ground provide GPS coordinates to EMS helicopter crews[5]. The crew then uses its navigation system to build a path to the destination and follows this path during its flight operation. Helicopters will rely on GPS to deviate en route around obstacles and to conduct its approach to reach its minimums to conduct a visual landing. Helicopters will regularly utilize GPS for guidance under 1000 feet AGL.

Given an EMS operation may go almost anywhere to conduct an emergency evacuation, unreliability of GPS is a significant operational risk. The risk is applicable to the crew operating the helicopter that relies on GPS for navigation. Additionally, the risk applies to the evacuee who may lose time in an evacuation if an EMS crew cannot land in immediate proximity of the scene because of an exclusion zone.

Law Enforcement

Law Enforcement helicopters are utilized as aerial units and provide information to the ground. When an aerial unit identifies a vehicle or individual of interest, the crew will relay GPS coordinates back to the ground for ground units to know where to go. When such aerial units are overhead, they are often operating in the 100 to 600 foot height range affected by GPS unreliability. Even during visual conditions, exclusion zones pose a risk of relaying incorrect GPS coordinates to ground units.

Fire

During large-scale fire fighting, fire fighters will provide burn position coordinates to aerial units. In their efforts to fight or prevent spread of large fires, fire fighters may elect to drop fire retardant from helicopters at specific locations. Should such positions be within an exclusion zone, the helicopter risks making a drop at the wrong site.

[5] The Committee acknowledges this aspect of the use case is outside the scope of this tasking. However, the Work Group believes it is important and should be evaluated by the NTIA/FCC, which is the appropriate regulatory body for this topic.

Helicopter – Other

Helicopter charter operators generally operate missions specific to the demands of the owner or customer on board. If the operator is not aware of the location of exclusion zones, they may risk the safety of both their operation as well as the travelers on board.

Unmanned Aerial Systems (UAS)

UAS's, particularly small vehicles weighing less than 5 kg, with increasing frequency operate in the airspace below 500' AGL for commercial, public, and recreational purposes. At present, GPS is the primary and standard mode of navigation for these systems.[6] GPS is used in a variety of navigation tasks including en route operations, station keeping, and support of geo fencing capability. GPS receivers commonly installed in commercially available small UAS do not meet Technical Standard Order (TSO) requirements.

Recent FAA announcements that streamline approval for access to airspace under 200' AGL by small UAS under the provisions of Section 333 of the FAA Modernization and Reform Act 2012 may significantly increase the volume of UAS activity at altitudes likely impacted by the proposed transmitters and exclusion zones.

The following are included as potential key operational impacts specific to UAS operations:

Geo Fencing

Exclusion zones with compromised GPS signals or availability may result in a loss or degradation of geo fencing capabilities that are becoming more critical for UAS operations. Such degradation could lead to UAS encroachment on flight restricted airspace.

Lose C2 Link/Return to Base

When a UAS loses its link to its source of Command and Control, the UAS relies on GPS to autonomously return the unit to a preplanned safe recovery location. Any interference within exclusion zones on this process could result in unsafe UAS operations during a lost link scenario.

Station Keeping/ Payload

Some applications of UAS focus on collection of data or imagery from specific locations. If UAS have unreliable GPS positions with exclusion zones, this may compromise the value and accuracy of the payload obtained data or imagery.

[6] Current proposed guidance requires UAS operators to maintain line-of-sight control with UAS. The Group anticipates the Final Rule will be similar with accommodation for rapid allowance of beyond visual line-of-sight.

Loss of Equipment

There is potential for a higher probability of loss of equipment due to unreliable navigation (i.e., increased probability of crash). This increased risk could negatively impact UAS economics, making the overall costs higher than they would be without the exclusion zone risk.

The operational scenarios and impact on UAS as a result of the establishment of exclusion zones are similar to those identified by the helicopter community. Current and future small UAS operations potentially impacted by the proposed exclusion zones include the following:

Visual Range UAS Operations

This category of UAS involves entities deploying small UAS in populated areas. These may be negatively impacted if GPS reception is compromised and the operator is unable to reliably navigate the small UAS. There are multiple operator examples in this group including:

- Aerial photography (e.g., real estate, wedding)
- Land surveying (construction, land management)
- News gathering (e.g., sports)
- Agriculture (crop monitoring, livestock management)
- Tactical support for First responders

For Visual Range UAS, key negative impacts from GPS interference include potentially compromised geo-fencing and return-to-base capability. Additionally, the operational utility of the UAS may be impacted as the usable area is decreased, the operational burden to check an additional database may increase and there may be constraints to fly automatic grid patterns or use features such as station keeping.

Beyond Visual Range UAS Operations

In this category, the UAS is flown out of sight of the pilot. This could rely exclusively on Area Navigation (RNAV) and some form of semi-autonomous operations. The FAA's current Pathfinder Program, which is exploring ways to safely expand unmanned operations in the NAS, has three tracks, two of which are focused on beyond visual range operations (crop surveying, rail inspection). This path will likely involve some level of certification.

Anticipated operations in this category include:

- Parcel delivery
- Right-of-way inspections (pipeline, rail)
- Traffic management
- Aerial photography (e.g., real estate, wedding)
- Land surveying (construction, land management)
- News gathering (e.g., sports)
- Agriculture (crop monitoring, livestock management, autonomous agricultural vehicles)

- Security
- First responders (e.g., search and rescue)

Similar to operations within the Visual Range, key negative impacts from GPS interference include potentially compromised geo-fencing and return-to-base capability. Additional impacts of exclusion zones for beyond line of sight operations include compromising GIS-based obstacle avoidance.

Again, the operational utility of UAS may be impacted with reduction in operational area, reduction in available flight corridors, added complexity to route planning, potential increase to operational burden due to checking an additional database and constraints to fly automatic grid patterns or use features such as station keeping.

Finally, exclusion zone operations would likely increase certification requirements and/or require additional navigation sources.

Military Impact

Based on the exclusion zones as defined, there may be some impact to military operations. Beyond the limited scope of the proposed exclusion zone, there may be significant impacts to military operations below 500' AGL, particularly on Military Training Routes and Special Use Airspace, and therefore, safety to the NAS, which needs to be evaluated.

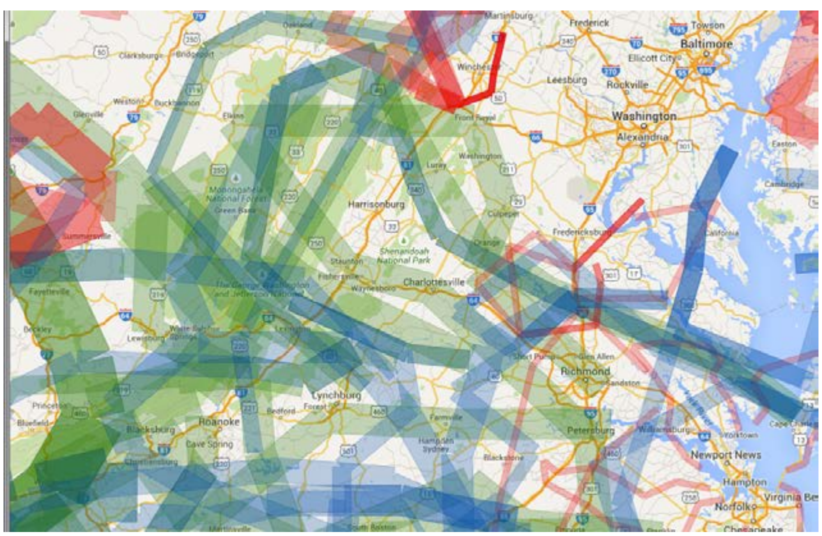
With respect to the three questions posed by the FAA to the TOC, the impact to military operations are at least the same as other NAS users. Not factored into the consideration of the question is the potential sensitivity of military grade GPS receivers. Additional studies on the potential impacts to military grade GPS receivers must be conducted before the military can analyze potential significance to military operations by the proposed use of exclusion zones.

Military GPS systems are not only used for aircraft navigation, but also in the guidance systems for air-to-ground and ground-based weapon systems. When a GPS inside a weapons system encounters GPS interference or GPS signal loss, the guidance package reverts to inertial navigation. Inertial navigation is significantly less accurate; the weapon achieves a published Circular Error Probable (CEP) of 13 meters under GPS guidance, but typically only 30 meters under inertial guidance (with free fall times of 100 seconds or less).

Exclusion zones as presented extend down to: within 7.5 NM of an airport to the minimum altitude where coverage would be required; between 7.5 NM and 15 NM to any airport to the minimum altitude at and above 300' AGL; and outside of 15 NM to any airport to the minimum altitude at and above 500' AGL. The exclusion zones do not consider military operations which often extend to the surface during aircraft navigation and weapons employment. The logical conclusion is that the exclusion zone having a lateral zone of 500’ would have impacts at least on the level to downward plane of a 500’ altitude and quite possibly more if the signal is conical and expands as it proceeds in a downward trajectory. Additionally, interference for GPS systems below this expanded zone looking upward to the GPS satellite constellation would also be affected. Therefore, the proposed exclusion zones would have an impact, creating significant operational and safety implications beyond the limited scope of question #5.

The military has Military Training Routes (MTRs) which are used for low-altitude, high speed training. MTRs are low-altitude corridors designed to support realistic training at speeds of more than 250 knots and at altitudes that range from ground level (surface) to 1,500 feet above ground level or higher. About half of the 500 routes are designated for Instrument Flight Rule (IFR) operations. Course widths vary between three NM to 20 NM either side of the reference line as depicted on the sectional and the routes are often 70 to 100 miles long and cover more than 1,916,000 square miles. MTRs often parallel or cross highways and even populated areas especially where legacy routes were encroached as cities expanded. Navigation is extremely difficult on high-speed low-altitude flights and GPS provides an essential aid to navigation. There exists a potential of a military aircraft touching up to 16 exclusion zones per minutes of low level training. Without knowledge of the locations and size of each exclusion zone or the length of time from GPS recovery, it could easily be assumed that GPS navigation would be unreliable. Hence, unreliable GPS at low altitudes provides a safety risk to the military operator of the aircraft as well as the communities underlying the Military Training Routes.

Figure 2 Location of Military Training Routes (MTRs) with respect to Major Highways



The proposed exclusion zones may have impacts to military operations due to the potential of flying through exclusion zones while on military training routes. The lack of proposed exclusion zones other than for air navigation with minimum altitudes are seen as a major flaw that may have significant operational limitations to aircraft navigation and safety implications to weapons employment military operations.

Finally, the NTIA, DoD, and interested industry have been working in recent years to understand the extent of military concerns around terrestrial downlink use of the adjacent band spectrum. To the extent this report identifies any new concerns about GPS availability for military applications, these issues need to be explained and understood in greater detail. To accomplish a better understanding of the potential issues, the existing NTIA and DoD structure should be utilized for further study and analysis.

General Aviation Fixed Wing Operations

There are multiple General Aviation scenarios that are impacted by Exclusion Zones:

Agriculture Operations

Example missions include crop dusting and other low level application of fertilizers and pesticides utilizing aircraft and autonomous ground vehicles. These place aircraft a few feet above ground. Navigation to and from the destination would likely be affected. Also, operational effectiveness would be diminished for typical operations that use sophisticated GPS swath guidance.

Ultra Light and Light-Sport Aircraft (LSA) Operations

Ultra Light and LSA aircraft that routinely operate at low altitudes may rely on GPS for primary navigation. These operators often utilize non-TSO GPS equipment.

General Aviation Operations In and Out of Public Airports

No exclusion zones would be established in areas that currently have published procedures. However, procedure development is an ongoing process in the NAS and consideration may be required for relocation or modification of ground transmitters as a result of future published procedures.

General Aviation Operations In and Out of Private Airports

Private airport operators “build” approaches that are not published or known to potential sources to GPS interference. Safety could be negatively impacted by the unexpected loss of navigation guidance on unpublished approaches. This could preclude the use of unpublished private approaches.

Response to Questions Posed to the TOC

4. Impact of Exclusion Zones on Flight Safety

Question: (c) Are the size and aggregated density of aircraft and helicopter exclusion zones where GPS-based TAWS/HTAWS alerts cannot be assured (Appendix C, section above, and reference [4]) sufficiently small so as to not impact flight safety? (d) Alternatively, what TAWS/HTAWS exclusion zones parameters should be considered?

Answer: (4c) The Exclusion Zones proposed in the October 2014 "GPS Adjacent-Band Compatibility Study Methodology and Assumptions" study negatively impacts GPS-based TAWS/HTAWS alerts.[7]

(4d) The response to question 5 addresses question 4d.

5. Operational Acceptability and Safety Implications

Question: Comments are requested regarding the operational acceptability and safety implications for the proposed exclusions, operational limitations and safety considerations identified in Appendix C of this report and Annex A of the reference [4] report including any alternative suggestions and supporting rationale.

Answers: The Exclusion Zones proposed in the Oct 2014 GPS ABC study have negative impacts to both flight safety and operations for multiple operational scenarios as documented in the operational scenarios presented in this report. Additionally, the exclusion zones as defined only go as low as 100 feet AGL and there are some scenarios (Agriculture, UAS) that have negative impacts below 100 feet AGL.

The group acknowledges that some level of GPS interference exists in the NAS today. Examples include shadowing, solar flares, DoD jamming, unintended emissions from radio transmitters, etc. However, the group cannot define a one-size-fits-all exclusion zone that works everywhere in the NAS. The use of radio spectrum needs to be evaluated against the different NAS use cases based on the proponent's spectrum signature and density of deployment in various

[7] a) TAWS is not mandatory equipment in all airplanes since it is only required by specific operating rules. These rules are 121.354 (all turbine-powered airplanes) and 135.154 (TAWS A for turbine-powered airplanes configured with 10 or more pax and TAWS B for turbine-powered airplanes configured with 6 to 9 pax).
b) A similar issue exists for helicopters where HTAWS is not mandatory equipment in all helicopters since it is only required by the recently published 135.605 operating rule for air ambulance operators.
c) Neither the TAWS TSO-C151() nor the HTAWS TSO-C194 require an obstacle database, let alone include requirements for the content of the obstacles that must be included in an obstacle database or the frequency at which an obstacle database must be updated.

environments. On a case-by-case basis, a particular definition of an exclusion zone may be acceptable in terms of operations and safety. The dimensions of new zones, their location and density need to relate to the specific operational scenarios and the impact on aviation safety. Current, accurate exclusion zone location and size data would need to be readily available to operators in the NAS.

6. Unique Considerations for Small UAV Operations

Question: (a) Considering the proposed fixed and rotary wing aircraft assumptions, exclusions, and limitations, are there safety impacts and operational limitations that are unique to small Unmanned Aircraft Vehicles (UAVs) operations? (b) If yes, please identify the unique operational use case scenarios and any associated safety and operational issues. (c) Propose additional assumptions and "exclusion zones" for consideration that would preclude the identified safety and operational issues (if any).

Answers: (6a-b) While there are multiple similarities between UAS and other operator types, particularly helicopters, some safety impacts and operational limitations from exclusion zones are unique to the *unmanned* nature of UAS. For example, geo-fencing, return to base, station keeping and elevated risk of loss of equipment are all more relevant to UAS with its reliance on GPS and no human within the operating vehicle to provide a visual backup. Finally, the UAS segment of aviation is also unique because of its current rapid growth and maturation.

The details of UAS-specific impacts are contained in the operational scenarios discussed above.

(6c) Please see the response to question 5 above. Additionally, exclusion zone definitions will be dependent upon receiver design resiliency and there is no standard for UAS.

Appendix A: Members of the GPS ABC Task Group

Clay Barber, Garmin International

Mark Cato, Air Line Pilots Association

Perry Clausen, Southwest Airlines

Santanu Dutta, LightSquared, Inc.

Rob Eagles, International Air Transport Association

John Foley, Garmin AT

William Geoghagan, National Air Traffic Controllers Association

Larry Hills, FedEx Express

Robert Ireland, Airlines for America

Margaret Jenny, RTCA

Bob Lamond, National Business Aviation Association (Co Chair)

Kelly Markin, The MITRE Corporation

Paul McDuffee, Insitu Inc. (Co Chair)

Ben Miller, Mesa County, CO Sheriffs Department

Trin Mitra, RTCA

Harold Moses, RTCA

Kieran O'Carroll, International Air Transport Association

Ajay Parikh, LightSquared, Inc.

Paul Railsback, Airlines for America

Melissa Rudinger, Aircraft Owners and Pilots Association

Geoff Stearn, LightSquared, Inc.

Harold Summers, Helicopter Association International

Gary Viviani, Insitu Inc.

Appendix B: FAA Tasking Letter

U.S. Department
of Transportation
**Federal Aviation
Administration**

OCT 07 2014

RTCA Paper No. 219-14/SC159-1021

Margaret Jenny
President
RTCA Inc
1150 18th St. NW, Suite 910
Washington, DC 20036

Dear Ms. Jenny,

As stated in my letter dated February 21, 2014, the Federal Aviation Administration (FAA) is participating in a Department of Transportation plan to determine and refine the processes, assumptions and analyses believed necessary as the basis of proposals for non-space, commercial applications in the frequency bands adjacent to the Global Positioning System (GPS) signals. The FAA proposed use of RTCA, Inc., as the forum for vetting assumptions for the Adjacent Band Compatibility assessment in order to increase transparency and maximize acceptance by the civil GPS aviation community.

The attached document addresses the planned approach for the first phase of the FAA's Adjacent Band Compatibility assessment. This first phase is intended to inform future proposals for the use of spectrum adjacent to GPS and ensure existing and evolving aviation uses of GPS are not affected. The document includes scenarios, assumptions and methodologies, and proposes questions for RTCA to address. Please coordinate with SC-159 and other committees (e.g., TOC and SC-228) that might provide perspective on the proposed "exclusion zones". Should the committees have any questions, please contact Ken Alexander, AIR-131 Navigation Team Lead, (202) 236-9794, ken.alexander@faa.gov. To facilitate our efforts, we would appreciate receiving your response by March 31, 2015.

Thank you for your consideration.

Sincerely,

Richard Jennings
Acting Assistant Manager
Design, Manufacturing and Airworthiness Division, AIR-101

Enclosure:
FAA Adjacent-Band Compatibility Study Methodology and Assumptions, October 3, 2014

5 Areas of Operation

Appendix C contains an excerpt from the January 20, 2012, DOT/FAA *Status Report: Assessment of Compatibility of Planned LightSquared Ancillary Terrestrial Component Transmissions in the 1526-1536 MHz Band with Certified Aviation GPS Receivers.* . One key part of that assessment was the determination of where aircraft would operate relative to the LightSquared transmitter locations. In particular, the study introduced assumptions regarding effective aircraft "exclusion zones" including:

> "For fixed wing aircraft: "In order to accommodate LightSquared transmitters that are mounted on towers where the tower may be included in the TAWS obstacle database, an exclusion zone is permissible as follows:
>
> a. For transmitters within 7.5 NM of an airport, if they are mounted on an obstacle that is taller than 100' AGL, then an exclusion zone that is the intersection of a cylinder centered on the obstacle (500' in radius and extending 100' above the top of the obstacle) and the region below the obstacle clearance surfaces (as defined by the FAA 8260 series orders) for all instrument procedures. The exclusion zone extends down to the minimum altitude where coverage would be required by paragraph 1c, d, or e above. The FAA must also retain the ability to publish new instrument procedures and establish new airports without undue constraints.
> b. For transmitters more than 7.5 NM away from any airport, if they are mounted on an obstacle that is taller than 200' AGL, then an exclusion zone that is a cylinder centered on the transmitter (500' in radius and 100' above the top of the obstacle), but not above 1000' AGL (including effects of falling terrain). The exclusion zone extends down to the minimum altitude where coverage would be required by paragraph 1c, d, or e above."

"For helicopters: In order to accommodate LightSquared transmitters that are mounted on towers where the tower is included in the HTAWS obstacle database, an exclusion zone is permissible. If they are mounted on an obstacle that is taller than 100' AGL, then an exclusion zone is defined that is the intersection of a cylinder centered on the obstacle (500' in radius and extending 100' above the obstacle) and the region below the obstacle clearance surfaces (as defined by the FAA 8260 series orders) for all instrument procedures. The exclusion zone extends down to 100' AGL. The FAA must also retain the ability to publish new instrument procedures or establish new heliports without undue constraints."

Appendix A of the January 20, 2012 report provides additional detail, including operations not addressed in this excerpt. This annex should be consulted and additional comments provided as appropriate.

Question #4 to RTCA: *(c) Are the size and aggregated density of* aircraft and helicopter *exclusion zones where GPS-based TAWS/HTAWS alerts cannot be assured (Appendix C, section above, and reference [4]) sufficiently small so as to not impact flight safety? (d) Alternatively, what TAWS/HTAWS exclusion zones parameters should be considered?*

Question #5 to RTCA: Comments are requested regarding the operational acceptability and safety implications for the proposed exclusions, operational limitations and safety considerations identified in Appendix C of this report and Annex A of the reference [4] report including any alternative suggestions and supporting rationale.

Question #6 to RTCA: (a) Considering the proposed fixed and rotary wing aircraft assumptions, exclusions, and limitations, are there safety impacts and operational limitations that are unique to small Unmanned Aircraft Vehicles (UAVs) operations? (b) If yes, please identify the unique operational use case scenarios and any associated safety and operational issues. (c) Propose additional assumptions and "exclusion zones" for consideration that would preclude the identified safety and operational issues (if any).

Please note that non-TSO compliant GPS equipment interference susceptibility may be substantially greater, or less than TSO approved receivers and antenna. Non-TSO GPS/GNSS

equipment is used for UAV navigation, positioning, attitude control and payload systems; electronic flight bags, installed equipment for situational awaremess, experimental and Light Sport Aircraft. Susceptibility needs to be characterized for each make, model and antenna pair. operators, manufacturers and GPS suppliers should participate in the parallel DOT Volpe center GPS Adjacent-Band Compatibility activities to ensure any unique operational use cases are considered and their GPS equipment susceptibility is characterized (http://www.rita.dot.gov/pnt/)Volpe POC: Steve Mackey stephen.mackey@dot.gov.

THE GOLD STANDARD FOR AVIATION SINCE 1935

Approved by the Tactical Operations Committee September 2015

Class B Airspace: Designation, Design and Evaluation

A Report of the Tactical Operations Committee in Response to Tasking from the Federal Aviation Administration

September 2015

Class B Airspace: Designation, Design and Evaluation

Contents

Background

To address the risk of midair collisions between IFR (Instrument Flight Rules) and VFR (Visual Flight Rules) aircraft, the FAA established protected airspace in which air traffic controllers manage air traffic operations to, from and through the airspace. Formerly known as Terminal Control Areas (TCAs), by the 1990s, TCAs became Class B airspace and were centered around airports with high density air traffic operations. In addition to establishing airspace classification, a set of mandates was established as part of a comprehensive plan to avert midair collisions. This included airspace designation criteria and design parameters, found in FAA JO 7400.2. Controller separation, pilot qualification, and aircraft equipage requirements were also established in this effort. This approach was applied to all classes of airspace – ICAO classes A through G. The mandates and requirements are the most restrictive for Class A and become less restrictive through G (currently, Class F is not used in the National Airspace System [NAS]).

Since the original criteria for Class B designation and design were established, a variety of structural changes have occurred within aviation that warrant a re-evaluation of these criteria. One key change has been the rise and fall of major airlines hub status for certain airports. Over the past decade, some airports with Class B airspace, such as Lambert–St. Louis International Airport (STL), Cincinnati/Northern Kentucky International Airport (CVG), and Pittsburgh International Airport (PIT) have seen their status as a primary hub removed and scheduled traffic drop precipitously. Today, 15 out of 37 primary airports with Class B airspace do not meet criteria for designation of Class B and some Class C airports have more operations than those with Class B airspace.

At the same time, there has been a growth of business aviation, cargo operations and low cost operators which have increased the use of secondary and satellite airports by high performance aircraft. Consequently, the mix of high performance IFR and lower performance VFR aircraft have evolved such that higher performance aircraft are operating to and from secondary or satellite airports in greater volumes, thus increasing the risk associated with the mix of IFR and VFR operations.

Finally, new technologies allow us to rethink Class B design. Recent advances such as the increased utilization of the Global Positioning System (GPS) for navigation provide an opportunity to evolve the design of Class B airspace. In a few cases, such as Seattle-Tacoma International Airport (SEA) as well as Los Angeles International Airport (LAX), the potential for replacing the traditional cylindrical "upside down wedding cake" with more linear designs, resulting in a smaller volume of protected airspace, has been demonstrated.

Given these developments over the last two decades, the FAA recognized a need a take a fresh look at the minimum criteria for designation of Class B airspace and asked the Tactical Operations Committee (TOC) to address the following:

- Class B designation requirements
- Appropriate considerations for Class B airspace design criteria
- The evaluation process for airspace biennial reviews including criteria to expeditiously reduce or eliminate Class B airspace that no longer meets designation requirements
- Guidance on how to gather local user input to any changes to Class B designation, design and evaluation as well as mechanisms to communicate a final updated process to key stakeholders.

Executive Summary

Background

In the decades since Class B designation criteria and design guidance were established, a variety of structural changes have occurred within the NAS that warrant a re-evaluation to determine if they are still applicable and whether they continue to serve the original purpose of protected airspace. The FAA requested the RTCA Tactical Operations Committee (TOC) to address the following issues related to designation, design and evaluation of Class B airspace:

- Designation of Class B Airspace
- Modification of Class B Airspace
- Evaluation of Class B Airspace
- Recommendations on the Process for External Engagement on Changes to the Class B Guidance.

Class C airports are typically the candidates for Class B designation and Class C airspace would likely replace Class B if it was revoked. Therefore, the Class B Task Group examined Class C designation criteria and design guidance in parallel to the group's efforts on Class B. Both classifications were developed to reduce the risk of midair collisions in congested airspace surrounding airports. With the aid of safety data and subject matter experts, the committee found that volumes of airspace designated as Class B, as well as Class C, have been effective in meeting their purpose.

Class C airspace protects less airspace for IFR operators than Class B. In determining whether Class B designation is warranted, a facility is required to demonstrate that Class B airspace is necessary to correct a current airspace problem that cannot be solved without Class B designation. One potential way to correct an airspace problem could be to expand an existing Class C design. Conversely, if Class B revocation is being considered, the result is likely to be less protected airspace. Using current design guidance, going from Class B to Class C airspace would reduce the lateral boundary from 30 to 10 nautical miles and reduce the ceiling from 10,000 to 4,000 feet eliminating the requirement that VFR aircraft communicate with ATC in this vacated volume of airspace. The Task Group concluded that the salient issue is not whether an airport meets Class B criteria, but rather whether the airspace solutions developed to address operational issues are appropriate and effective (e.g., expansion of Class C or modification of Class B airspace).

There are operational and safety implications associated with expanding and reducing protected airspace. Expansion can improve safety in areas of high concentrations of IFR and VFR traffic. However, the expansion can result in VFR aircraft having to fly additional miles and in the compression of airspace available to VFR traffic, which can lead to an unsafe flying environment. Reduction of protected airspace will make more airspace available to VFR aircraft in which they can operate without talking to ATC. However, reduction of protected airspace will, by definition, result in less protected airspace for IFR traffic. These types of considerations and tradeoffs highlight why it is important to consider each site's unique operational issues when determining the appropriate airspace solution.

Summary of Recommendations

Table 1 is a summary of the committee's recommendations organized by the Class B issues identified by the TOC. The remainder of this section provides a high level overview of the rationale behind the recommendations. More detail on the rationale for each recommendation is provided in the following sections.

Designation of Class B Airspace

Safety data and discussions with subject matter experts indicate that the majority of safety related issues occur outside of the protected volumes of airspace and that both Class B and C airspace are achieving their objective. From the same sources, the committee learned that the ratio of IFR to VFR traffic is not a reliable way of assessing collision risk. Additionally, the committee noted that there is no discernible relationship between the enplanement criterion and the risk of midair collision and that the primary airport traffic count criterion does not reflect other factors that contribute to airspace complexity in busy terminal areas. Safety metrics that are more directly related to IFR/VFR collision risk than the original criteria are now available. The feasibility of using them to generate risk-based metrics for designation criteria should be examined.

Modification of Class B Airspace

Class B and C airspace design guidance was based on legacy TCA cylindrical criteria centered on ground based NAVAIDS. The purpose of the designs was to facilitate containment within the protected airspace with simplified designs based on the technology available at the time. Today's navigational technology allows for better navigation and containment. Class B and C design guidance should not be rigidly applied. Designs should be site specific and take into account any unique operational and safety needs along with consideration of all of the airspace users.

Evaluation of Class B Airspace

The current evaluation process considers candidates for Class B designation and possible modifications to existing Class B airspace. However, no criteria or process currently exists for the revocation of Class B airspace. For determining whether Class B is needed, safety related data now exist and should be used to help determine airspace needs. Class B revocation will require estimating how safety will be impacted by potentially reducing the size of the protected airspace which could affect the behavior of VFR traffic in particular.

Public Engagement Recommendations

Consistent with other significant airspace changes, effective public engagement is recommended before the implementation of any changes to Class B designation criteria, design guidance, or evaluation process. Whether communicating draft language or a Final Rule of changes to the Class B guidance, the group recommends the FAA utilize one centralized and consistent package of information across all public engagements to mitigate the potential of mischaracterization and message confusion.

Table 1 Summary of the Committee's Recommendations

Class B Issue	Recommendations
Designation of Class B Airspace	The FAA should remove the enplanement and air carrier/air taxi quantitative criteria
	Total Airport Operations Counts should also include traffic from secondary airports and overflights
	An airspace complexity index should be developed to address airspace considerations beyond that of Total Airport Operations
	Criteria should be developed for airports with strong seasonal or time of day demand surges
	Use available safety data to more directly assess airspace complexity issues and mitigations
	Provide more guidance on how operational issues can be addressed without the Class B designation
	The FAA should periodically review Class B designation criteria to determine whether they should be adjusted
Modification of Class B Airspace	Remove existing guidance indicating design should be centered on a NAVAID and amend guidance to ensure designers leverage the flexibility to configure airspace that maintains Class B safety standards
	Require a review of Class B airspace and instrument procedures whenever new runways are built, existing runway changes occur (e.g. decommissioned, lengthened, or shortened) or when procedures are developed or old ones canceled
	Encourage designers to make maximum use of existing tools to accommodate VFR flights through or around Class B airspace
	Evaluate lateral and vertical gaps between adjacent airspace where VFR flight has the potential to increase hazards for Class B or Class C operations
	Recommend introduction of an altitude buffer between protected IFR airplanes and VFR aircraft
	Ensure all Class B Terminal Area Charts include information on IFR arrival/departure routes to/from the primary airport and explore possibility of extending to include secondary airports
Evaluation of Class B Airspace	Update FAA Order 7400.2 with additional guidance on data sources relevant for the biennial review
	Develop criteria for identifying when Class B airspace should be revoked
	Outline a process for revoking Class B airspace
Recommendations on the Process for External Engagement on Changes to Class B Guidance	Conduct further public engagement before implementation of any design, designation and evaluation changes to Class B guidance
	Whether communicating draft language or a Final Rule of changes to the Class B guidance, the group recommends the FAA utilize one centralized and consistent package of information across all public engagements

Methodology

The Tactical Operations Committee established an Ad Hoc Task Group, known as the Class B Task Group to draft a response to the task request. The task group was composed of airspace experts from a variety of perspectives including MITRE, FAA Airspace Policy, FAA Safety, FAA Service Center, Commercial flight operators, Business Aviation, Department of Defense (DoD), General Aviation, and Labor. (Please see Appendix A for a full list of Task Group membership.) The group held a series of meetings from January through June 2015 in which it examined the history of protected airspace, data analysis on a wide variety of issues relating to Class B and C airspace as well as Case Studies around the NAS. During April through July 2015, the Task Group deliberated the task questions and documented its conclusions in this consensus report.

Based on the questions posed by the FAA, the Task Group elected to organize its response along four major categories:

1) Designation of Class B Airspace
2) Modification of Class B Airspace
3) Evaluation of Class B Airspace
4) Recommendations on the Process for External Engagement on Changes to the Class B Guidance.

Designation of Class B Airspace

Introduction and Observations

For an airport to be considered as a candidate for new Class B airspace designation, the criteria shown in Table 2 must be met (adapted from 7400.2, Chapter 15-2-1). The first two rows contain quantitative criteria and are necessary but not sufficient for the establishment of Class B airspace. The last row is qualitative and must be met in addition to the quantitative criteria to establish Class B.

Table 2 Criteria to be Considered for Designation of Class B Airspace

Criterion from 7400.2 15-2-1	Text of Criterion
Enplanement	The primary airport serves at least 5 million passengers enplaned annually
Total Airport Operations	The primary airport has a total airport operations count of 300,000 (of which at least 240,000 are air carriers and air taxi)
Necessity of Class B Designation	The Class B designation will contribute to the efficiency and safety of operations, and is necessary to correct a current situation or problem that cannot be solved without a Class B designation.

Class C airspace will typically be the candidates for Class B designation. Therefore, the Class B Task Group recognized the need to examine Class C designation criteria and design guidance in parallel to the group's efforts on Class B. Class C designation criteria are shown in Table 3.

Table 3 Criteria to be Considered for Designation of Class C Airspace

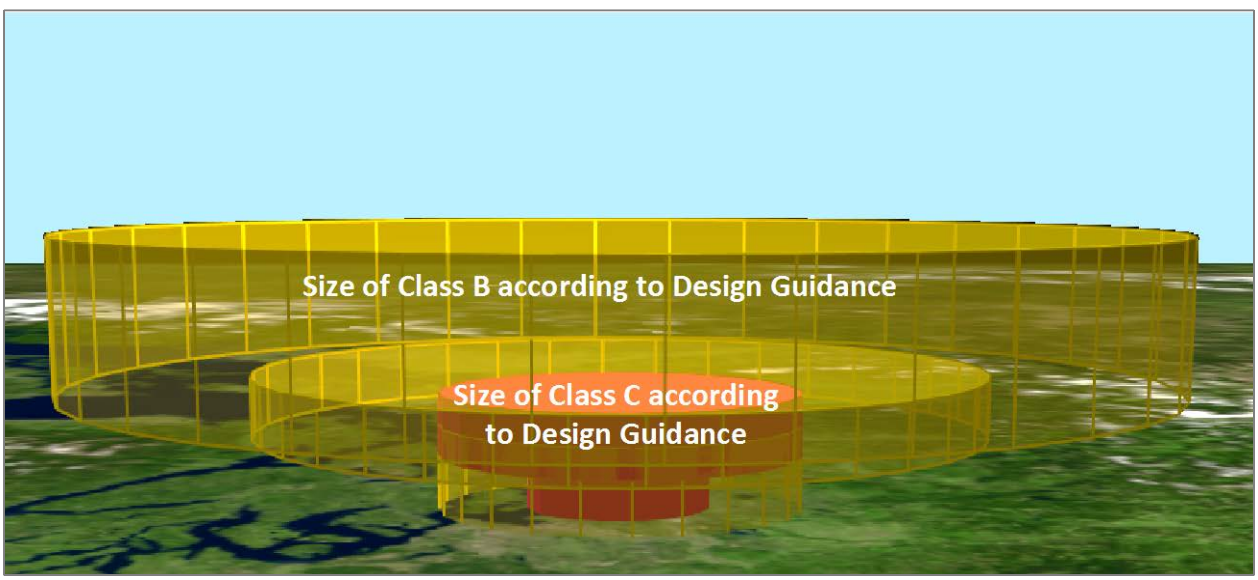
Criterion from 7400.2 16	Text of Criterion
Primary Airport Operations	An annual instrument operations count of 75,000 at the primary airport
Primary and Secondary Airport Operations	An annual instrument operations count of 100,000 at the primary and secondary airports in the terminal area hub
Enplanement	An annual count of 250,000 enplaned passengers at the primary airport

There are large differences between the quantitative designation criteria and the design guidance for Class B and C airspace. As can be seen in Table 4 and Figure 1, if strictly followed, Class C design guidance results in a much smaller volume of protected airspace than Class B airspace.

Table 4 Design Guidance for Class B and C Airspace

Airspace Class	Design Guidance in 7400.2
Class B	Generally from the surface to 10,000 feet mean sea level (MSL). The outer limits of the airspace must not exceed a 30 NM radius from the primary airport. This 30 NM radius will generally be divided into three concentric circles: an inner 10 NM radius, a middle 20 NM radius, and an outer 30 NM radius.
Class C	Generally from the surface to 4,000 feet above the airport elevation (charted in MSL); usually consists of a surface area with a 5 NM radius, an outer circle with a 10 NM radius that extends from no lower than 1,200 feet up to 4,000 feet above the airport elevation

Figure 1 Size of Class B and Class C According to Design Guidance



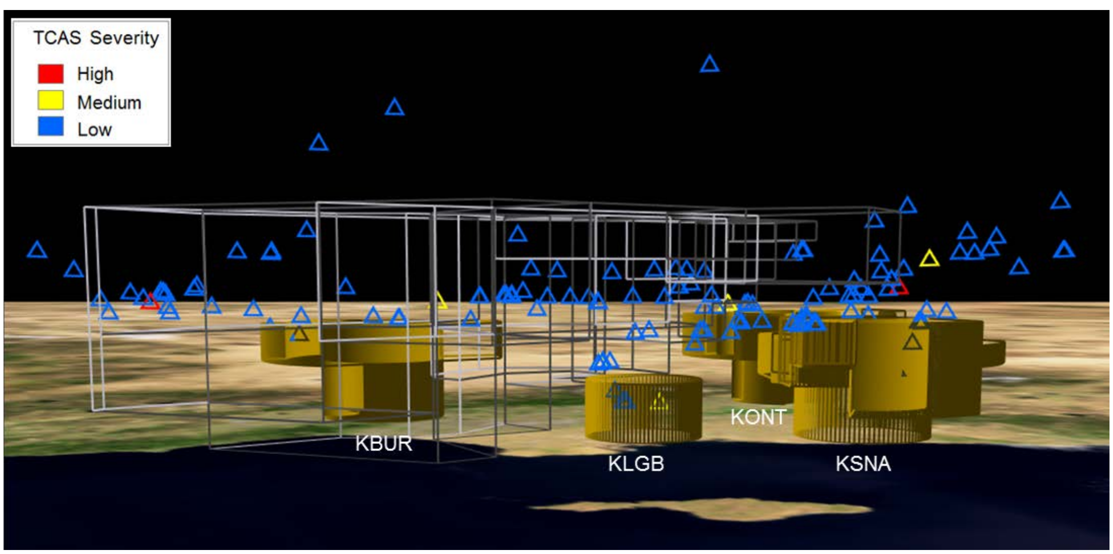
Purpose of Class B and C airspace

According to Chapter 15 of the 7400.2 guidance, the primary purpose of Class B airspace "is to reduce the potential for midair collisions in the airspace surrounding airports with high density air traffic operations". A secondary purpose of Class B is to "enhance the management of air traffic operations to and from the airports therein, and through the airspace area". Class C airspace areas are designed to improve aviation safety by reducing the risk of midair collisions in the terminal area and enhance the management of air traffic operations therein." Although the purpose of both Class B and Class C is to reduce the potential for midair collisions, the target aircraft, as well as the geographical areas, differ. Class B is intended to enhance the management of aircraft in and out of the airport(s) contained in the surface portion of the Class B while Class C is for aircraft traversing the terminal area regardless of intended airport of operation. The difference between the two is that Class B criteria do not consider the traffic in the surrounding terminal area in its calculation while Class C criteria do.

Effectiveness of Class B and C Airspace

Given that the purpose of both Class B and C designations is to reduce the risk of midair collisions, the Task Group sought to determine whether the two designations have achieved their objective. Both Class B and Class C have been effective at avoiding midair collisions. Additionally, discussions with FAA Air Traffic Organization (ATO)'s Safety and Technical Training (AJI) and operational facilities (Daytona Beach International Airport, Southern California TRACON) indicated that the overwhelming majority of Traffic Collision Avoidance System (TCAS) Resolution Advisories (RAs) or other reported safety incidences between IFR and VFR flights associated with Class B and C airports occur outside (but near the boundaries) of Class B and C airspace volumes. Calculated TCAS RAs between IFR and VFR traffic at Class C airports near Los Angeles International Airport (LAX) (Figure 2) support the findings from the discussions. The TCAS RAs were calculated using actual flight tracks and TCAS Exploration Display (TED), a tool developed for AJI by MITRE. (For a high level description of the TED tool, see Appendix C.)

Figure 2 TED Tool Location of Calculated TCAS RA's in the Los Angeles Basin



Recommendations

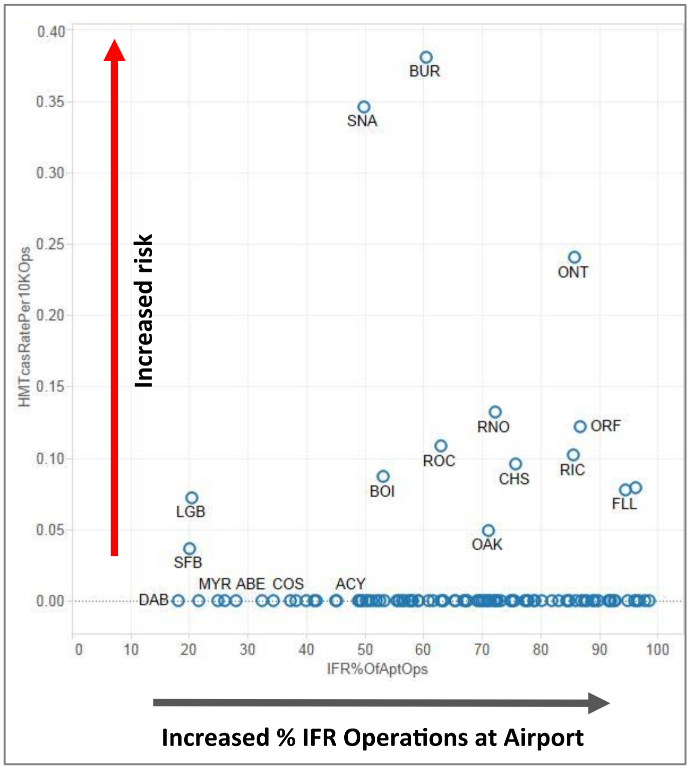
Enplanement and Air Carrier/Taxi

Recommendation 1. The FAA should remove the enplanement and air carrier/air taxi quantitative criteria.

Both the Enplanement and 240,000 operations Air Carrier and Air Taxi criteria give more weight for providing Class B airspace protection to aircraft carrying large numbers of passengers. However, reducing mid-air collisions between large passenger aircraft and VFR is not explicitly referred to in the purpose statement for Class B airspace, which focuses more generally on the avoidance of midair collisions between IFR and VFR aircraft.

The air carrier and air taxi operations requirement of at least 240,000 suggests that airspace with higher percentages of IFR traffic are more in need of Class B designation. Analysis presented to the Task Group (Figure 3) and discussions with subject matter experts indicated that different levels of IFR percentages (from low to high) can contribute to airspace complexity and the potential need for Class B. Figure 3 shows calculated TCAS RA rates between IFR and VFR traffic using TED. High and medium severity level TCAS RAs are displayed versus the percentage of IFR traffic. All of the airports on the chart are Class C with the exception of Long Beach Airport (LGB) which is a Class D with known airspace complexity issues. The TCAS RA rates for each airport are calculated beyond the boundaries of the Class C airspace, laterally from 10 to 30 nm and vertically from 4,000 to 10,000 feet, to represent the additional airspace that would be protected by Class B. The airports with the highest TCAS RA rates (Bob Hope Airport [BUR] and John Wayne Airport [SNA]) have IFR traffic percentages in the 50 to 60% range.

Figure 3 TED Tool Calculated TCAS RAs vs Percent of IFR Operations



Total Airport Operations

Recommendation 2.	**Total Airport Operations counts should also include traffic from secondary airport and overflights.**

Currently, the Total Airport Operations criterion (300,000 operations required) includes only the primary airport. The Task Group did not have the time or the resources to thoroughly assess whether 300,000 operations is the appropriate threshold. Therefore, the Task Group is not recommending that the 300,000 operations requirement be changed. However, traffic from nearby airports and overflights can affect traffic behavior and increase ATC workload and potential traffic hazards and therefore should be included in the Total Airport Operations count criterion.

Recommendation 3.	**An airspace complexity index should be developed to address airspace considerations beyond that of Total Airport Operations.**

There are considerations beyond Total Airport Operations that can provide insight into airspace needs. Special Activity Airspace (SAA) and terrain that are in close proximity to a primary airport can affect traffic behavior and increase ATC workload and potential traffic hazards. An airspace complexity index would be analogous to what is used to adjust traffic counts when determining air traffic facility levels. For airports that have challenging airspace features but do not meet the Total Airport Operations criterion, the development of an airspace complexity factor that can be applied to modify (increase) the number of operations could help to elevate their operational issues. However, as with all other candidates, the airport would still have to demonstrate that the Class B designation is the only remedy for their operational issues.

Recommendation 4. Criteria should be developed for airports with strong seasonal or time of day demand surges.

The impact of demand surges can be diluted by the Total Airport Operations criterion. The current criterion does not address airports where, if annualized, peak seasonal traffic counts or peak hourly blocks would meet the current Class B quantitative designation requirements. Demand surges during these time periods increase both air traffic controller workload and the level of safety hazards. For example, the winter months at Fort Lauderdale–Hollywood International Airport (FLL) have significant increases in demand. The 300,000 Total Airport Operations criterion averages to 25,000 operations a month. Figure 4 shows monthly airport operations at FLL where monthly counts have exceeded 25,000 operations in the past and are currently coming close to that threshold again[1]. An annualized monthly operations criterion could be considered to address seasonal surges.

Additionally, Class C airspace currently has an option for full-time or part-time designation. A similar approach could be considered for Class B airspace with time of day demand surges. There may be some locations, now or in the future, where multiple consecutive peak hours of traffic demand meets Class B quantitative thresholds when annualized. In such cases, consideration may be given to identifying criteria for a part-time Class B designation that has published times and is well understood by all operators. Note, part time Class B designation would only be feasible if the peak hours were consecutive and the activation and deactivation of Class B airspace were clearly defined. This may be the case for some airports, particularly those with overnight cargo operations.

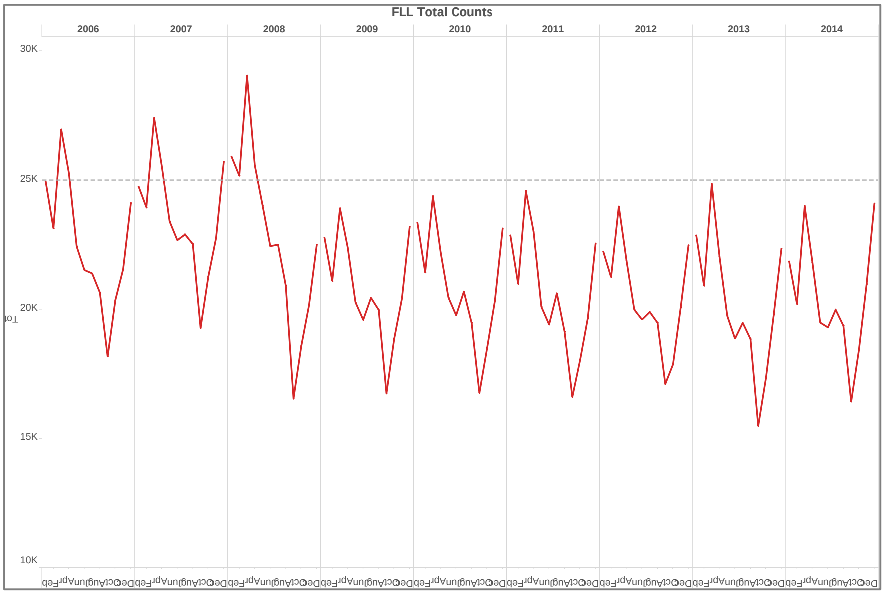
As with all other candidates, meeting the quantitative criteria would not be sufficient to receive Class B designation – they would still be subject to the requirement of proving that the Class B designation is necessary to address their operational issues.[2]

---

[1] Runway construction in FLL reduced operations from 2011 to 2014. A second parallel runway was completed in September 2014 and flight operations are no longer constrained in FLL by construction.

[2] The Task Group considered dynamic (i.e., “on/off”) Class B sectors. After further deliberation, the Task Group identified key challenges in the current operational environment with implementation of dynamic Class B sectors. The core question is what mechanism would be utilized to notify pilots when a Class B sector is active or inactive. Additional questions include how VFR aircraft utilizing an inactive Class B sector would be notified to vacate, how long the aircraft would have to vacate, what equipment would be required for VFR aircraft to utilize inactive Class B sectors, etc. Existing technology such as ADS-B In and Moving Map displays with color-coding and voice alerting could be utilized to operationalize this concept. Ultimately, there is significant effort required in operational concept development, aviation rule making and regulations before such a concept could be implemented. The Task Group believed the concept of dynamic Class B sector was interesting and worth future consideration. However, it was also deemed to be beyond the scope of this report and no formal recommendation on the topic is included in this document.

Figure 4 Monthly Traffic Counts in FLL: Feb 2006 to Dec 2014



Recommendation 5.	Use available safety data to more directly assess airspace complexity issues and mitigations.

Although the Total Airport Operations criterion serves as a good starting point in identifying potential Class B locations, it does not directly address safety issues between IFR and VFR traffic. Ideally, safety metrics (actual or calculated metrics based on surveillance data) should be used to assess the risk of midair collision between IFR and VFR aircraft. Currently, the FAA's Operations Support Group (OSG) does not have access to safety metrics beyond excursions in PDARs and the ability to do keyword searches on items like TCAS in Mandatory Occurrence Reports (MORS), NASA Aviation Safety Reporting System (ASRS), and Air Traffic Safety Action Program (ATSAP) databases. Access to tools (e.g., AJI's TED) that generate safety metrics that directly measure risk of IFR/VFR interaction would enhance the candidate assessment process. Safety metrics should be examined to determine how risk-based safety metrics can be used to assess the need for Class B airspace. In the near term, airports with above average TCAS RA rates for their airspace class can be identified and considered as candidates. They would still be subject to the requirement of proving that the Class B designation is necessary to address their operational issues.

Necessity of Class B Designation

Recommendation 6.	Provide more guidance on how operational issues can be addressed without the Class B designation.

Class B airspace protects a larger volume of airspace than Class C and requires additional levels of compliance from controllers, pilots, and aircraft. Therefore, before Class B airspace should be established, evidence of the need for Class B designation must be provided. If other mitigation strategies besides Class B designation can address the operational issues presented, they must be applied instead.

Some mitigation strategies that have proven effective at Class C airports are pilot education, procedural changes, and expansion of Class C lateral limits. Although language describing configuration variations for Class C airspace (7400.2 Chapter 16) allows flexibility to expand beyond the standard design parameters, lateral boundaries have only been extended on the final approach segments of the airspace as in the case of Mineta San José International Airport (SJC). The FAA should make it clear that current design language provides the flexibility to expand Class C as needed both laterally and vertically. Further expansion of Class C may be warranted for some operational issues and should be considered before the designation of Class B airspace.[3]

Future Considerations

Recommendation 7.	**The FAA should periodically review Class B designation criteria to determine whether they should be adjusted.**

The NAS has changed significantly over the last 20 years – e.g., changes in passenger and cargo aircraft hubs, business aviation, and GPS navigation. Given that the rate of change in the NAS is actually increasing (particularly regarding new entrants), it is recommended that designation criteria be reviewed as technology, demand or other structural factors evolve in the NAS.

Design of Class B Airspace

Introduction and Observations

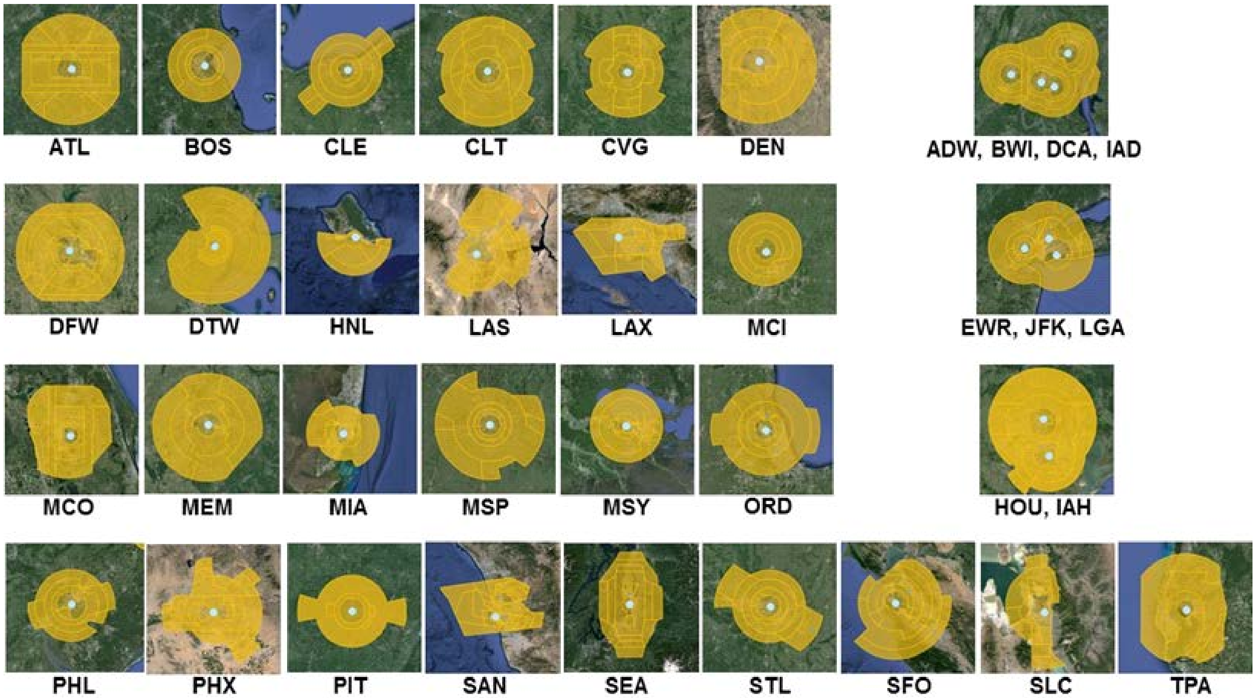
Existing Class B Designs

The majority of existing Class-B airspace designs are generally cylindrical, centered on a high density airport, and based on Navigational Aids (NAVAIDS) such as a VORTAC, VOR/DME or lat/long coordinates. The lateral limit extends outward up to 30NM from the primary airport and divided into three concentric circles. The vertical limit of Class-B airspace normally extends from the surface at the primary airport up to 10,000 feet MSL. Moving outward from the primary airport the floor of the airspace steps up to varying altitudes.

The following diagram shows current Class B airspace designs within the NAS. Note that the majority of these are cylindrical in shape.

[3] Careful consideration should be given in order to avoid creating unintended flying hazards. Expansion of Class C or designation of Class B airspace may result in the reduction of airspace in which VFR aircraft operate by compressing the traffic in these areas which is also utilized by high performance IFR operators to and from secondary airports.

Figure 5 Bird's Eye View of Class B Airspaces in the NAS



14 CFR section 91.131 sets aircraft equipment requirements in order to operate within Class B. The navigational requirement is to have an operable VOR or TACAN receiver or an operable and suitable Area Navigation (RNAV) system. The Class B navigational design basis appears to be in line with 91.131 (a) (2) *"…each person operating a large turbine engine-powered airplane to or from a primary airport for which a Class B airspace area is designated must operate at or above the designated floors of the Class B airspace area while within the lateral limits of that area*". The requirement in the current order is to utilize ground-based NAVAIDs with arcs around them. However, the air traffic system has and continues to evolve and this general approach to Class B airspace design no longer makes sense in a NAS with increased use of GPS navigation and initial decommissioning of legacy NAVAIDs.

Though Class B design has been primarily dependent on a NAVAID, containment within the Class B is in fact a shared responsibility and not completely dependent on a NAVAID. Aircraft operating to and from the primary Class B airport are either on published procedures or radar vectors. In either case, both procedures and air traffic controllers have a requirement to keep traffic contained within the Class B and none are dependent on a cylindrical NAVAID based defined airspace. Furthermore, 14CFR section 91.131 equipment requirements do not apply to those intending to operate outside of Class B and therefore situational awareness of the Class B lateral limits may not be readily identifiable especially if they are not referenced to visible landmarks at all times of the day. Landmarks, NAVAIDs and Waypoints serve more to keep non-participating aircraft outside of Class B airspace despite not having any navigational equipment requirements in place.

Variations in Class B Designs

Simplification and standardization is a prime objective in current guidance and evidenced by the great majority of the Class B designs shaped cylindrically and out to the maximum 30 NM radius. The down side to the strict adherence of this criteria is that it does not consider the strides made in modern navigational technology and does not require consideration of stakeholder needs such as VFR flyways, arrival/departure procedures, nor does it take into account the reality of much increased high performance aircraft to/from satellite airports, etc. However, a paradigm shift has occurred in redesign efforts exercising the seldom used liberty contained in FAAO7400.2 to create irregular Class B designs. Examples include:

- Less cylindrical (SEA, LAX) increased the amount of VFR airspace at the perimeter of Class B
- Include VFR flyways (ATL, LAX) created a passage for VFR traffic within the Class B
- Most designs 10,000 MSL but some are above/below (SLC, DEN, LAS) add needed protective airspace

Recommendations

General Design

Recommendation 8.	**Remove existing guidance indicating design should be centered on a NAVAID and amend guidance to ensure designers leverage the flexibility to configure airspace that maintains Class B safety standards.**

Most Class B designs follow the default cylindrical shape with a maximum 30 NM outer lateral limit and 10,000 foot Mean Sea Level (MSL) vertical height. This appears to be a carryover from legacy TCA designs. However, modern navigational technology has paved the way to appropriately shape airspace in a way that maintains the level of safety while allowing for a more efficient and equitable use of the airspace that considers all stakeholder needs. Some considerations for adjustments to the traditional cylindrical design include airport geometry, arrival/departure procedures, obstacle departure procedure (ODP), Standard Instrument Approach Procedures (SIAP) and terrain.

With the use of modern navigational technology including GPS, and moving maps, the same levels of safety can be maintained through proper identification of the boundaries. Nonstandard configurations could leverage a combination of VOR/DME, Lat/Long, geographic reference points, and RNAV waypoints to define the boundaries.

There should be guidance on when Class-B airspace should deviate from the standardized configuration. This guidance may include existing language in the order that states "…where an operational advantage and safety is maintained, Class-B airspace dimensions can be less than the traditional cylindrical radius".

Although many aircraft operating outside of Class B are known to be using GPS moving map technology to ensure Class B avoidance no assurance exist that this technology is being used 100% of the time. To aid aircraft with all variations of navigational equipment can identify the Class B regardless of design, as much as feasible align boundaries to coincide with prominent landmarks. This would assist aircraft equipped for pilotage up to Performance Based Navigation (PBN) to increase situational awareness and identify Class B boundaries.

Recommendation 9.	**Require a review of Class B airspace and instrument procedures whenever new runways are built, existing runway changes occur (e.g. decommissioned, lengthened, or shortened) or when procedures are developed or old ones canceled.**

All of the design parameters are thrown into question as traffic patterns change due to the airport geometry, utilization of runways, or as technological advances in aircraft and navigation evolve. When this occurs it would warrant a staff study to evaluate changes and whether any modification is required to the airspace. Such studies should be initiated in time for implementation in conjunction with runway openings or airspace changes.

Recommendation 10.	**Encourage designers to make maximum use of existing tools to accommodate VFR flights through or around Class B airspace**

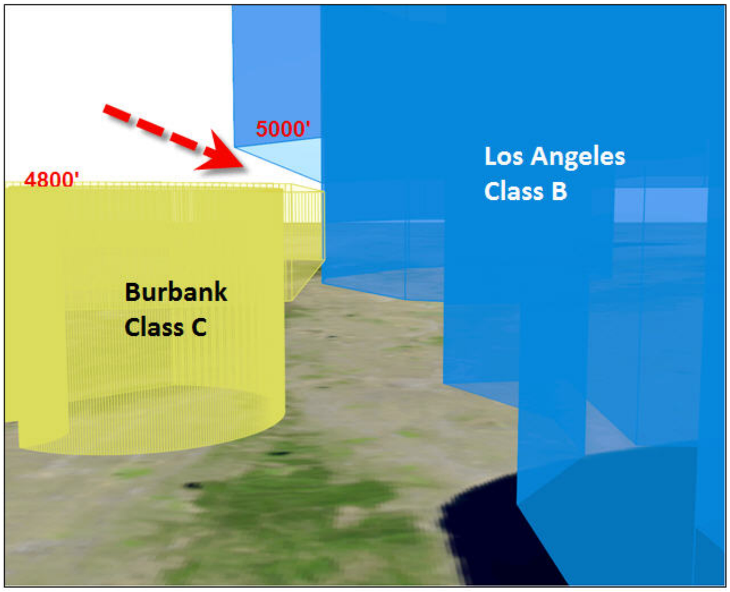
Current guidance for staff study includes guidance on provision of VFR flyways and other mechanisms to access Class B. Such provisions have been underutilized historically and should be given proper consideration in future Class B designs.

Lateral and Vertical Limits

Recommendation 11.	**Evaluate lateral and vertical gaps between adjacent airspace where VFR flight has the potential to increase hazards for Class B or Class C operations.**

Several Class B, Class C, and Class D airspaces are in close proximity either laterally or vertically. By current design criteria, close proximity airspace create lateral or vertical gaps between their respective airspaces which VFR aircraft often fly through without coordinating with Air Traffic Control (ATC), creating a hazard. Examples of this are common throughout the NAS and can be seen at the confluence of the Los Angeles Class B airspace northern boundary where it borders the Burbank Class C airspace. VFR aircraft routinely traverse this area immediately below Class B at 4900' to avoid the Burbank Class C. See illustration below.

Figure 6 Gap between Burbank Class C and Los Angeles Class B



Procedure and Airspace designers need to be cognizant of unintended lateral or vertical gaps between Class B, Class C, and Class D airspace that encourage VFR aircraft to operate through the lateral margins or between the floor of Class B and Ceiling of Class C airspace.

Recommendation 12. Recommend introduction of an altitude buffer between protected IFR airplanes and VFR aircraft.

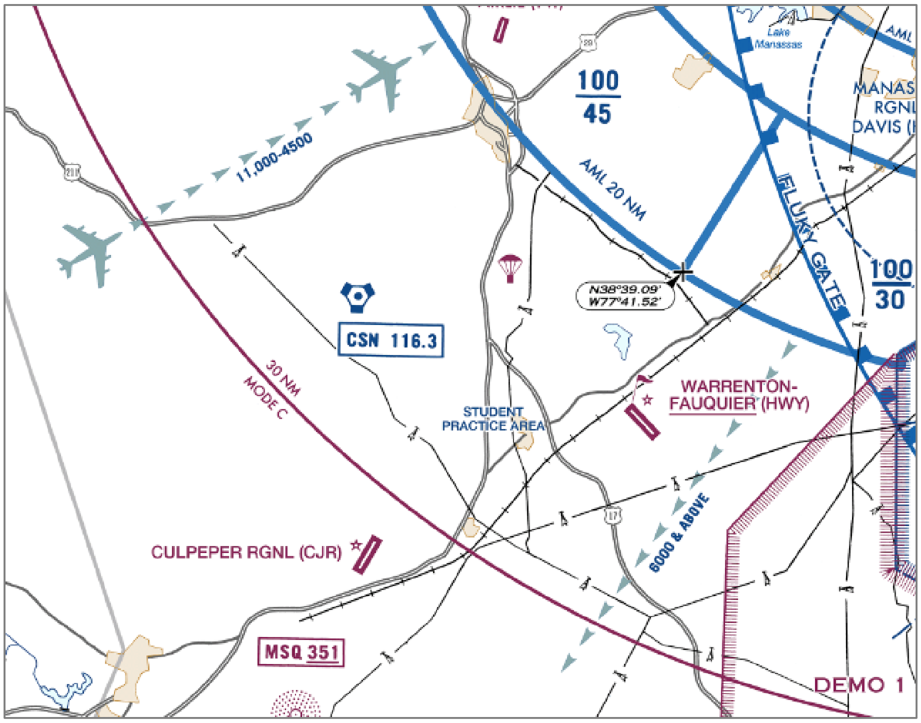
There are known TCAS RA issues between IFR aircraft operating at low altitudes above the base of Class B airspace and VFR aircraft operating at altitudes under the Class B floor. Federal Regulations allow VFR aircraft to fly at any altitude below 3,000 feet AGL up to the floor of Class B airspace. Further, VFR aircraft outside Class B airspace are not required to contact ATC which increases the risk of a mid-air collision with aircraft inside Class B airspace flying procedural altitudes or during climbs and descents.

Procedure and airspace designers should consider establishing an altitude buffer between aircraft operating within and outside of Class B airspace to mitigate the risk of midair collisions and reduce TCAS RA events. Establishing a buffer may require that the altitude of Class B floors will need to change and designers should consider establishing VFR flyways to minimize compressing VFR aircraft transitioning under Class B floors.

Recommendation 13. Ensure all Class B Terminal Area Charts include information on IFR arrival/departure routes to/from the primary airport and explore possibility of extending to include secondary airports.

During the course of the group's deliberations, there was discussion of the possibility that some VFR flights outside of Class B could improve their avoidance of IFR arrival/departure routes if the pilots knew where these are located. Currently the Terminal Area Chart (TAC) for most Class B airspace areas also have a VFR flyway chart that includes these IFR routes. There is benefit for all Class B's as well as secondary airports to include this information.

Figure 7 Washington TAC Chart Depicting IFR Arrival and Departure Routes

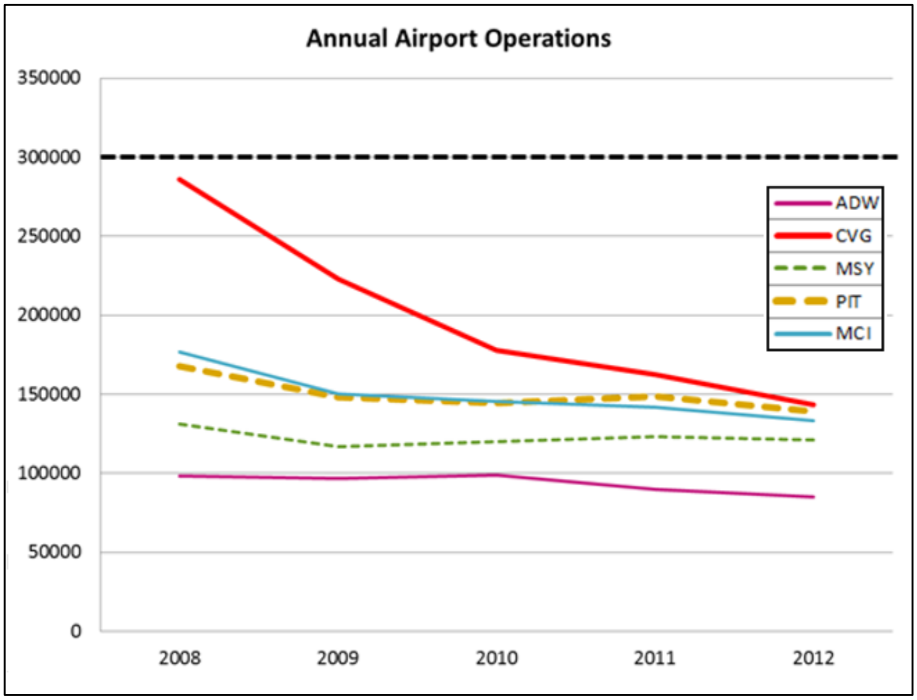


Evaluation Process for Class B Airspace Biennial Reviews

Introduction and Observations

Historically, the airline industry has used the hub and spoke route structure to schedule operations. This resulted in hub airports having a traffic volume significantly above what local demand would support. As the industry has evolved, due to economic fluctuation and airline consolidation, several airports which were formerly hubs have lost that status and have experienced a significant loss of traffic volume. Those that had Class B airspace designation to support their previous volume now fall far below the threshold for establishing a Class B. Figure 8 shows selected airports with the most dramatic drop below the Class B establishment criteria of 300,000 annual operations since 2008. Some of these airports have had annual operations below this threshold since 2006.

Figure 8 Annual Operations for Selected Airports with Class B Airspace



Given that many of these airports do not meet all of the quantitative criteria for establishing Class B airspace, the FAA is considering whether revocation of Class B airspace designation for some of these airports is warranted and in the public interest. Revocation would entail canceling of the existing Class B and replacing with an appropriate class designation. While 7400.2 does acknowledge that Class B airspace can be revoked, the FAA has no experience with taking this action. Therefore, the FAA is requesting comments and recommendations on establishing criteria and a process to revoke a Class B airspace area.

In reviewing Chapter 15, *Class B Airspace*, of FAA Order JO 7400.2, *Procedures for Handling Airspace Matters*, the following captures several recommendations concerning the biennial review process.

Recommendations

The following recommendations to address shortcomings in guidance for the biennial review are provided below.

Recommendation 14. Update FAA Order 7400.2 with additional guidance on data sources relevant for the biennial review.

While FAA Order 7400.2 does provide references to data sources suitable for the administration of Class B airspace, they are only relevant for determining the need for establishing it. Since the FAA Order was first established, the FAA has made significant advances in data analytics that would be relevant to the administration of Class B airspace. The workgroup recommends that the FAA review its data assets and identify those that would support the biennial review's goal of determining whether Class B airspace should be revoked or modified. Citing them will provide consistency among those offices conducting biennial reviews and will facilitate a more efficient process.

Modifications to Class B airspace boundaries should be informed by safety related data such as Class B excursions, TCAS events, safety issues identified by the FAA's Air Traffic Safety Action Program (ATSAP). Potential data sources useful for assessing if an airport's Class B airspace is still warranted include traffic counts from OPSNET and Terminal Area Forecast (TAF) data which would be help determine whether an airport with low annual traffic counts would be high enough in the future to warrant Class B airspace.

After appropriate data and tools in the FAA have been identified, FAA Order 7400.2 should be updated. Moving forward, as the FAA evolves its data enterprise assets and new data sources and tools are made available, FAA Order 7400.2 should be updated with those that are deemed pertinent to Class B airspace biennial review.

Recommendation 15. Develop criteria for identifying when Class B airspace should be revoked

Chapter 15 of the FAA order is primarily focused on establishing and, to a lesser extent, modifying Class B airspace. While criteria is provided for actions concerning Class B airspace, there are no criteria explicitly identified to determine when an airport no long warrants having Class B airspace. It appears that determining if the airspace should be revoked is left to the discretion of specific regional service area office conducting the biennial review. While this is not inherently flawed, this may lead to inconsistencies in managing these type of situations across the NAS.

In addition to the lack of criteria for identifying when an airport no longer needs Class B airspace, there is no guidance as to how long should the FAA wait before starting the process to revoke the airspace.

It is recommended that FAA Order 7400.2 be updated to provide guidance for when an airport's Class B airspace should be revoked. This guidance should provide

- **A Threshold for when such an action should be considered.** The threshold for revoking an airport's airspace should be set low enough compared to the one for establishment to avoid an airport wavering between requiring Class B and not due to periodic fluctuations in annual numbers. For illustrative purposes, a potential threshold for consideration is an annual operational count that is 80% of what is needed to establish the airspace. The FAA would need to determine the actual threshold value.
- **Guidance on how long the condition must exist before action is initiated**. For illustrative purposes, annual operations need to be below 80% of the annual operations needed for establishment for a period of three years.
- **Guidance on taking into account forecast information**. For example, if the FAA's Terminal Area Forecast (TAF) indicates that annual operations will return to an acceptable level within 3 years then the process for revoking the airspace should not begin.

Recommendation 16. Outline a process for revoking Class B airspace

Given the large percentage of airports with Class B airspace that have operations well below the minima for establishment, the need to provide specific guidance is now more evident. It's recommended that FAA Order 7400.2 be updated to include a process for revoking Class B airspace. In looking to develop a suitable process, the FAA's current process for establishing Class B airspace may serve as a useful template. Some key aspects of the process for revoking Class B airspace are:

- Identification of stakeholders who should be notified
- A step in which input from relevant stakeholders is collected
- Identification of what would replace the Class B
- Alignment with the FAA's Safety Management System (SMS) requirements for making a change to the NAS
- A review period where the airspace revoked can be assessed to determine whether any safety concerns associated with the change have emerged

Process for External Engagement on Changes to the Class B Guidance

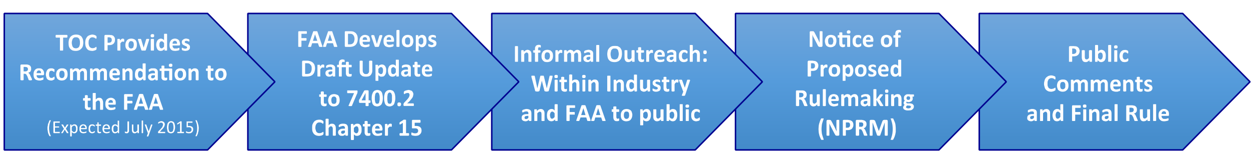
The Task group was requested to provide recommendations to the FAA on the process to gather additional input from the public on any changes to the Order for Class B airspace as well as how to best communicate any changes once they are finalized.

Input to Changes to Class B Guidance

Recommendation 17. Conduct further public engagement before implementation of any design, designation and evaluation changes to Class B guidance.

The following diagram depicts the Task Group's recommendation of how the FAA intends to move forward on implementing changes to the Class B Order:

Figure 9 Recommended Process for Implementation of Updated Class B Guidance



The group anticipates that, based on the findings of this report as well as other effort within the FAA, the FAA will develop a draft change to the Order on Class B airspace, FAA 7400.2. Upon developing such a draft, the group recommends two methods of outreach. First, the Class B Task Group and Tactical Operations Committee has robust participation from a number of membership based organizations in the NAS. The group recommends the FAA collaborate with groups such as the Aircraft Owners and Pilots Association (AOPA), Airlines 4 America (A4A), the Air Line Pilots Association (ALPA), National Business Aviation Association (NBAA),the National Association of State Aviation Officials (NASAO), the National Air Traffic Controllers Association (NATCA), the Regional Airline Association (RAA), and others to enable these organizations to communicate the work of this Task Group and draft changes to the 7400.2 to their membership.

The FAA should also conduct its own informal public outreach after developing a draft change to the Class B guidance. The FAA's public outreach will likely include community meetings. Such meeting are expected to consist of: an FAA presentation of the intended change to the Class B Order, presentations by members of the public who desire to speak and a question and answer session.

The FAA should consider offering a comment period following the date of the last informal outreach meeting to allow the public to submit any written comments on the proposal. Interactions from the meetings as well as any written comments would serve as input to potential adjustments to the proposed changes to the Class B order. The final draft language of the Class B order would then be published in a Notice of Proposed Rulemaking (NPRM). This would initiate a formal public comment period. The FAA would review and adjudicate all comments. When ready, the FAA would prepare and submit the final rule for publication in the Federal Register.

The process above is modeled off of the current process for designating or redesigning a Class B airspace. Changing the language in the Order, however, is a NAS-level issue as opposed to an airport-level issue for Class B airspace. Hence, the most significant challenge to the FAA in the process depicted above will be effective public outreach on a *NAS level*. The Class B Task Group recommends that the FAA identify an appropriate set of public community meetings to provide sufficient coverage of a cross section of facilities. Additionally, the group recommends that some community meetings be held online for members of the public that wish to participate but cannot attend any of the in-person sessions. All community meetings should be announced in the Federal Register. Additional mechanisms to communicate such meetings to the public are included in the following section of this report.

Communicating Updated Process

Recommendation 18. Whether communicating draft language or a Final Rule of changes to the Class B guidance, the group recommends the FAA utilize one centralized and consistent package of information across all public engagements.

Once a Final Rule is published, the FAA also needs to ensure it is effectively communicating the new information to the public. There are several new approaches being used today to reach out to the flying public beyond standard avenues. It is important to keep in mind that messaging has to be consistent across the National Airspace System, and information should be uniform, therefore the story centralized. In efforts to streamline efforts we would suggest the Federal Aviation Administration (FAA) have one package of information and storyline that goes out to each of the public meetings.

Examples methods to communicate new information are as follows:

- FAA Safety Team (FAAST) Team Representatives – FAA
- FAA website
- “Grass roots” efforts - could include local seminars
- Local Groups - Southern California Airspace Users Working Group (SCAUWG) and others/ pilot associations

- Fly In Events - Sun and Fun, Aircraft Owners and Pilots Association (AOPA) (Fly-In's), Experimental Aircraft Association (Oshkosh), National Business Aviation Association Conference, Helicopter Association International Conference
- Social media - Facebook and Twitter Pages
- Airport Volunteer Network/ local pilots – AOPA
- Digital Magazine/E Pilot- AOPA
- Local flight schools to require instructors to be trained, some kind of sign off sheet
- Have local FOB's attach an information sheet to fuel slips

Examples to communicate in a more traditional way are as follows:

- Reaching out to Fixed Based Operators with informational materials
- Educational meetings for the pilot community
- Educating Flight Standard District Offices and Local ATC with changes

Appendix A: Members of the Class B Group

Chris Baum, Air Line Pilots Association

Marc Henegar, Air Line Pilots Association

Darrell Pennington, Air Line Pilots Association

Robert "Rip" Torn, Air Line Pilots Association

Melissa McCaffrey, Aircraft Owners and Pilots Association

Brian Townsend, American Airlines, Inc.

Hazen Briggs, Federal Aviation Administration

Dan Creedon, Federal Aviation Administration

Gemechu Gelgelu, Federal Aviation Administration

Gary Norek, Federal Aviation Administration

Brenda Stallard, Federal Aviation Administration

Phil Santos, FedEx Express

John Allen, JetBlue Airways

Joe Bertapelle, JetBlue Airways

Chris Stephenson, National Air Traffic Controllers Association

Kim Stevens, National Association of State Aviation Officials

Keith Gordon, National Business Aviation Association

Nat Iyengar, National Business Aviation Association

Bob Lamond Jr, National Business Aviation Association

Blanca Aguado, RTCA, Inc.

Trin Mitra, RTCA, Inc.

Thor Abrahamsen, The MITRE Corporation

Debra Moch-Mooney, The MITRE Corporation

Glenn Morse, United Airlines, Inc.

CDR Joel Doane, US Department of Defense

Bill Reabe, US Department of Defense

Appendix B: Current Designation and Design Guidance for Class B Airspace (7400.2 Chapter 15)

Chapter 15. Class B Airspace

Section 1. General

15–1–1. PURPOSE

a. The primary purpose of a Class B airspace area is to reduce the potential for midair collisions in the airspace surrounding airports with high density air traffic operations. Aircraft operating in these airspace areas are subject to certain operating rules and equipment requirements.

b. Additionally, Class B airspace areas are designed to enhance the management of air traffic operations to and from the airports therein, and through the airspace area.

15–1–2. REGIONAL/SERVICE AREA OFFICE EVALUATION

a. Service area offices must biennially evaluate existing and candidate Class B airspace areas using the information contained in this chapter as a guideline.

b. If the conclusion of an evaluation indicates that airspace modifications should be made, regions/service area offices must follow the applicable procedures in this order.

c. Additionally, any planned modifications to, or establishments of, Class B airspace areas must be coordinated with Airspace Regulations and ATC Procedures Group prior to any public announcement.

Section 2. Class B Airspace Standards

15−2−1. CRITERIA

a. The criteria for considering a given airport as a candidate for a Class B airspace designation must be based on factors that include the volume of aircraft, the number of enplaned passengers, and the type/nature of operations being conducted in the area.

b. For a site to be considered as a new Class B airspace candidate, the following criteria must be met:

1. The primary airport serves at least 5 million passengers enplaned annually;

2. The primary airport has a total airport operations count of 300,000 (of which at least 240,000 are air carriers and air taxi); and

NOTE−
Operation counts are available from the Office of Aviation Policy and Plans, Statistics and Forecast Branch, APO−110. Enplaned passenger counts may be obtained by contacting the Office of Airport Planning and Programming Division, APP−1. Current validated counts are normally available in mid−October of the current year for the previous year.

3. The Class B designation will contribute to the efficiency and safety of operations, and is necessary to correct a current situation or problem that can not be solved without a Class B designation.

NOTE−
The above is the minimum criteria. It should be noted that when the criteria for the establishment of a Class B airspace area is met, it is merely an indication that the facility is a candidate for further study.

c. Although an airport meets the minimum passenger and air traffic operations criteria for a Class B designation, other factors must be considered, such as: would a Class B designation contribute to the efficiency and safety of operations in the area: and is there a current situation or problem that cannot be solved without the designation of Class B airspace.

15−2−2. DESIGNATION

Class B airspace area locations must include at least one primary airport around which the Class B airspace area is designated.

15−2−3. CONFIGURATION

a. General Design. Simplification of the Class B airspace area configuration is a prime requisite. Its vertical and lateral limits should be standardized and must be designed to contain all instrument procedures within Class B airspace. The number of sub−areas should be kept to a minimum.

b. Lateral Limits. This airspace should be initially designed in a circular configuration centered on the primary airport. Describe the airspace area using NAVAIDs as references where available on the primary airport in the following order of preference: VORTAC, VOR/DME, etc.

1. The outer limits of the airspace must not exceed a 30 NM radius from the primary airport.

2. This 30 NM radius will generally be divided into three concentric circles: an inner 10 NM radius, a middle 20 NM radius, and an outer 30 NM radius.

3. The inner 10 NM radius area may be subdivided based on operational needs, runway alignment, adjacent regulatory airspace, or adjacent airports.

4. The areas between 10 to 20 NM and 20 to 30 NM may be vertically subdivided because of terrain or other regulatory airspace.

c. Vertical Limits. The upper limit of the airspace normally should not exceed 10,000 feet MSL. The inner 10 NM area must normally extend from the surface to the upper limits of the airspace. This segment may be adjusted to coincide with runway alignment, adjacent airports, other regulatory airspace, etc., but must encompass, as a minimum, all final approach fixes and minimum altitudes at the final approach fix. The floor of the area between 10 and 20 NM must be predicated on a 300−foot per NM gradient for 10 NM. This segment will normally have a floor between 2,800 feet and 3,000 feet above airport elevation. This floor must remain constant for that segment, but may be adjusted considering terrain and adjacent regulatory airspace. However, segmentation should be held to an absolute minimum. The floor of the area between 20 and 30 NM must be at an altitude consistent with approach control arrival and departure procedures. It is expected that this floor would normally be between 5,000 and 6,000 feet above airport elevation. In the segment between 20 and 30 NM, exclusions are permitted to accommodate adjacent regulatory airspace and/or terrain.

d. Variations. Any variation from the standard configuration must be addressed in the staff study.

e. Satellite Airports. When establishing the airspace floor, consider the adverse effect on satellite airport operations as well as operations at the primary airport. When airspace directly over a satellite airport is not required, it should be excluded from the Class B airspace. Special published traffic patterns and/or procedures may be required for satellite airports.

Section 3. Class B Airspace Processing

15–3–1. RESPONSIBILITIES

a. The Airspace Regulations and ATC Procedures Group Manager is responsible for oversight of the Class B airspace designation/modification process. All NPRMs and final rules must be issued by Airspace Regulations and ATC Procedures Group. Airspace Regulations and ATC Procedures Group will provide assistance, as needed, to the regions/service area offices in developing Class B airspace actions.

b. The service area office is responsible for coordination to determine Class B airspace candidacy, or the need for modifications to an existing area. As part of this responsibility, the service area office must perform an analysis of the Class B airspace candidate and document the analysis in a staff study. Preparation of the staff study may be delegated to the facility.

15–3–2. STAFF STUDY

The staff study must be in the format detailed in FAAO 1800.2, Evaluations, Appraisals, and Staff Studies. At a minimum, the staff study must include the following:

a. A written description and the graphic depiction of the proposed area.

b. Graphic depiction(s) and analysis of the following:

1. Existing routes with associated altitudes that VFR traffic use while operating en route through the area or transitioning to all affected airports (charted VFR flyways).

2. Proposed VFR Flyways, with associated altitudes that would be charted to accommodate VFR aircraft desiring to transit the Class B airspace area (see FAAO 7210.3, chapter 11, National Programs).

3. A redundant boundary description including VOR/DME and latitude and longitude points outlining the proposed Class B area. In addition, where possible, include geographical features.

4. Routes with associated altitudes that IFR traffic use to conduct en route operations through the area being analyzed.

5. IFR departure and arrival traffic flows, including SIAPs, instrument departure procedures, STARs, and preferential arrival and departure routes associated with each runway configuration.

c. A narrative discussion and rationale of the following:

1. Number of aircraft based and types of operations conducted at affected airports.

2. Numbers of VFR operations that receive ATC service, that are denied service, and that circumnavigate the present terminal airspace configuration. Include any anticipated increase or decrease in these numbers if a Class B airspace configuration is modified or so designated.

3. Average delay in minutes now experienced by VFR operations in obtaining ATC services, and any anticipated increase or decrease in this number.

4. The facility's ability to provide ATC service to IFR and VFR traffic within the boundaries of its delegated airspace.

d. Analyses of staffing options, and issues, such as:

1. Current staffing status and the anticipated staffing requirements for implementing the Class B airspace.

2. Major proposals/comments submitted by user groups and an analysis and/or disposition of each.

3. Impact on air traffic and air navigation facilities including new or modified control positions required, if any, and new or relocation of navigational aids/communication equipment.

e. Environmental considerations.

f. Conclusions. Include a discussion on how the proposed establishment or modification will enhance safety and the efficiency of airspace management.

15–3–3. AIRSPACE USERS COORDINATION

a. Pre–NPRM. The service area office must ensure that user input is sought and considered prior to formulating any planned Class B airspace area design.

1. An ad hoc advisory committee, composed of representatives of local airspace users, must be formed to present input or recommendations to the FAA regarding the proposed design of the Class B airspace area. The service area office should provide advice and assistance on technical matters to the committee as needed.

2. Informal airspace meeting(s) must be conducted in accordance with Chapter 2 of this order.

3. Based on the results of the region's analysis and the staff study, the service area office must determine whether the effort should be continued to NPRM or terminated. The service area office will forward the proposal, all pertinent documentation (including advisory committee and informal airspace meeting input), and the region's/service area office's recommendations, to Airspace Regulations and ATC Procedures Group for further action. If it is determined to proceed with the rulemaking process, Airspace Regulations and ATC Procedures Group will prepare the NPRM.

b. Post−NPRM. The service area office must:

1. Review all comments received in response to the NPRM and informal airspace meeting(s).

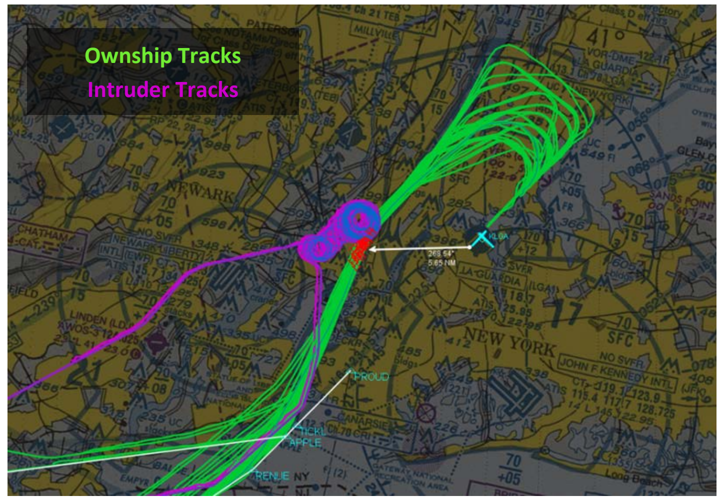
2. Coordinate with the concerned facility to address all substantive aeronautical comments.

3. Forward a discussion of how each substantive comment was addressed, along with the region's/service area office's recommendation for final action on the proposal, to Airspace Regulations and ATC Procedures Group.

Appendix C: Description of TCAS Exploration Display (TED) Analysis

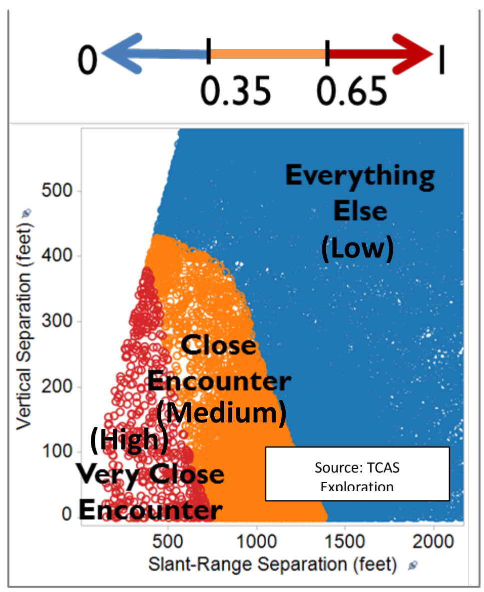
TED was developed by MITRE CAASD's Aviation Safety Information Analysis and Sharing (ASIAS) program. It identifies encounters that likely triggered a TCAS RA based on National Offload Program (NOP) radar surveillance data and the TCAS II Version 7.0 logic simulator. TCAS II is required on any turbine-powered aircraft of more than 33,000 pounds or any passenger aircraft with more than 30 seats (Code of Federal Regulations (CFR) Title 14 Part 121.356). TED provides approximation of TCAS behavior and evaluates proximity based on TCAS thresholds where both range and vertical thresholds must be exceeded to trigger an alarm. Figure 10 shows is an example of the tool output and features TCAS RAs triggered on arrival to KLGA.

Figure 10 TCAS Exploration Dashboard, September 2013



The simulated TCAS RA data are categorized by risk level, which align with the FAA TCAS RA risk levels. Three risk levels are considered: low, medium and high.The focus of the analysis was on the more serious high and medium risk events, but the analysis also considered low risk events as potential indicators of emerging trends. The minimal risk events were not analyzed as they tend to be "nuisance" RAs that generally are not separation violations. Figure 11 llustrates the values associated with TCAS separation.

Figure 11 Risk Assessment Levels for TCAS RAs



Appendix D: FAA Tasking Letter

U.S. Department
of Transportation
**Federal Aviation
Administration**

Mission Support Services
800 Independence Avenue, SW.
Washington, DC 20591

NOV 21 2014

Ms. Margaret T. Jenny
President
RTCA, Inc.
1150 15th Street, NW, Suite 910
Washington, DC 20036

Dear Ms. Jenny:

The Federal Aviation Administration (FAA) is responsible for establishing Class B airspace areas to reduce the risk of midair collision in the airspace surrounding airports with high density air traffic operations. Airspace standards are set under FAA JO 7400.2, Procedures for Handling Airspace Matters. FAA Service Area offices complete evaluations on existing and candidate Class B airspace areas using the information contained in Chapter 15 as a guide. When the criteria for the establishment of a Class B airspace area is met, it is merely an indication that the facility is a candidate for further study.

The evaluation and resulting determination to proceed with rulemaking is completed prior to any public announcement. To ensure the best possible outcome is reached for all stakeholders, the FAA is considering updating the evaluation requirements to better identify when further action is needed. It is the intent to provide a more thorough analysis of the available information as early in the evaluation process as possible. This necessitates a more detailed list of designation requirements used when evaluating existing and candidate Class B airspace areas.

We believe the Tactical Operations Committee (TOC) can provide valuable feedback for consideration to help the FAA ensure that any changed processes benefit the safe and efficient management of the National Airspace System. The goal is to establish a process that ensures airspace designations and design are commensurate with the risks involved with high volume mixed VFR/IFR operations while maximizing airspace efficiency and access. Committee feedback will help the FAA establish clear guidelines regarding the need to establish, as well as, verify, plan, and implement changes to Class B airspace areas. Specifically, the FAA requests comment and recommendations on the following:

- Class B airspace designation requirements.
- Appropriate considerations for Class B airspace design criteria.
- The evaluation process for airspace biennial reviews including criteria to expeditiously reduce or eliminate Class B sirspace that no longer meets designation requirements.
- Obtaining input from affected users as early in the process as possible.
- Identifying the best mechanism(s) to communicate updated processes to key stakeholders.

The FAA will provide Subject Matter Experts for this task as needed. To ensure that the TOC considers all relevant issues, the Task Group should, at a minimum, include airport operators, aircraft operators (airlines, pilots, and general aviation), and state aviation officials.

We seek the TOC's recommendations on the items at the 3rd Quarter FY 2015 TOC meeting. Once the task team is established, we will work with TOC Leadership to determine if interim reporting deliverables and milestones are appropriate. Once the task is complete, the Agency will consider the committee's recommendations for potential changes to existing processes.

Sincerely,

Elizabeth L. Ray
Vice President, Mission Support Services
Air Traffic Organization