FAA
Air Traffic Organization

Session 2 – CPDLC and ADS-C Lessons Learned

ANSP Preparation and implementation

ICAO Operational Data Link Seminar – Accra, Ghana
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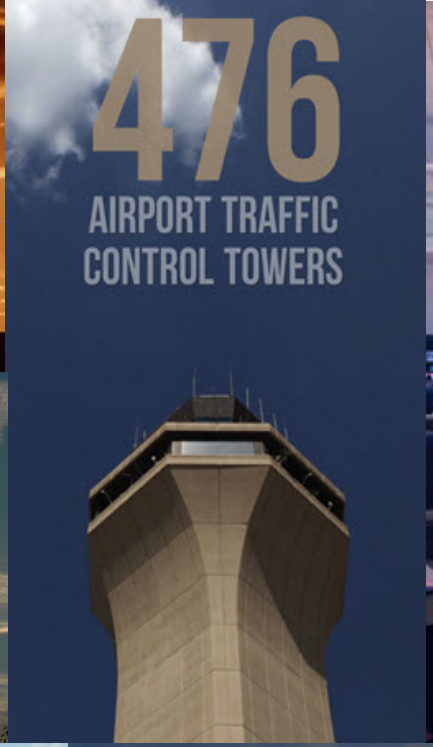
8 August 2016

ICAO Operational Data Link Seminar

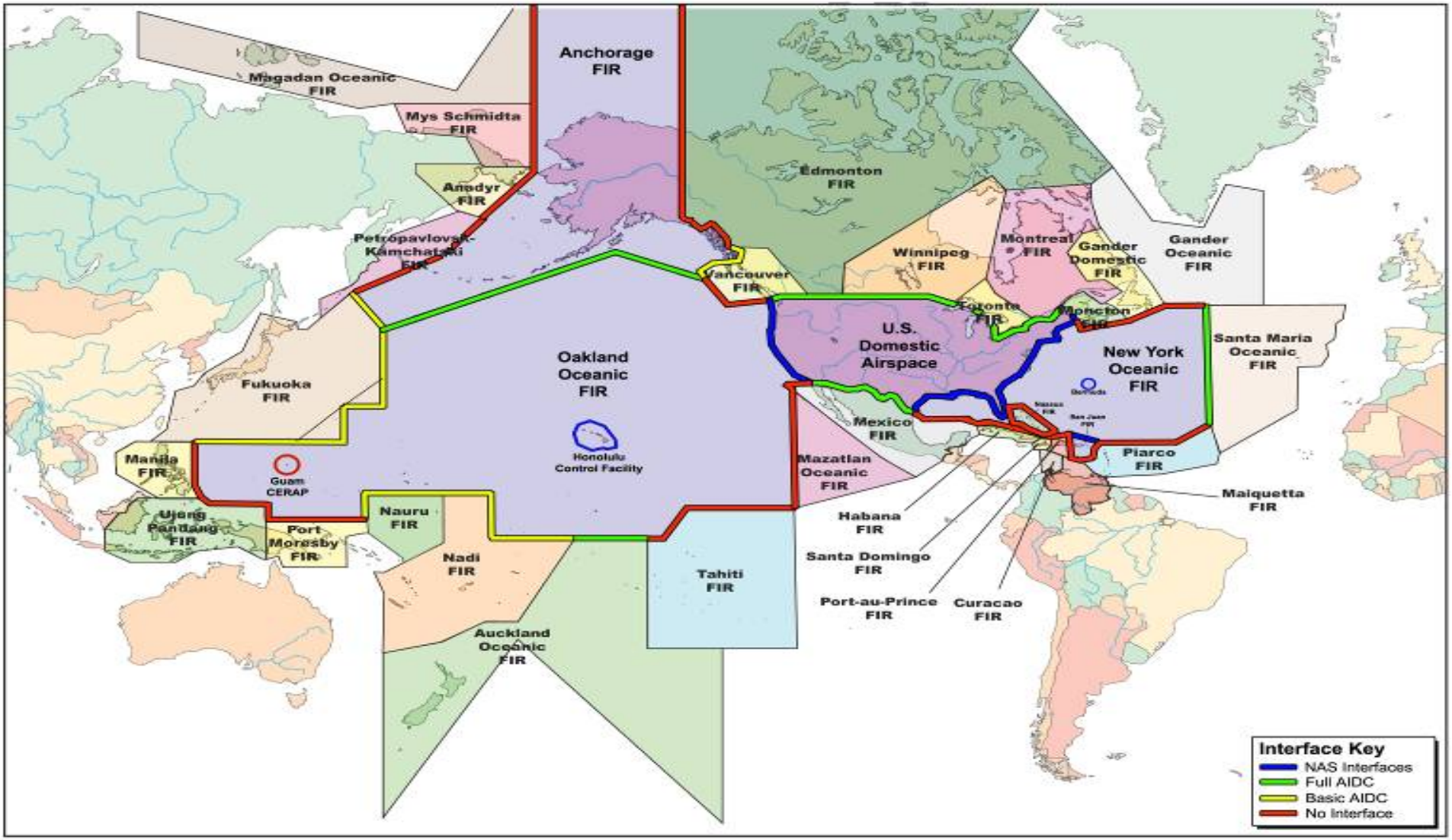
- **Overview**
  - **Who are we? Why are we here?**
  - **New York FIR**
  - **How did we get there**
  - **Service Improvement Considerations**
  - **North Atlantic Airspace**
  - **Data Link Mandate – Working Together**
  - **Questions**



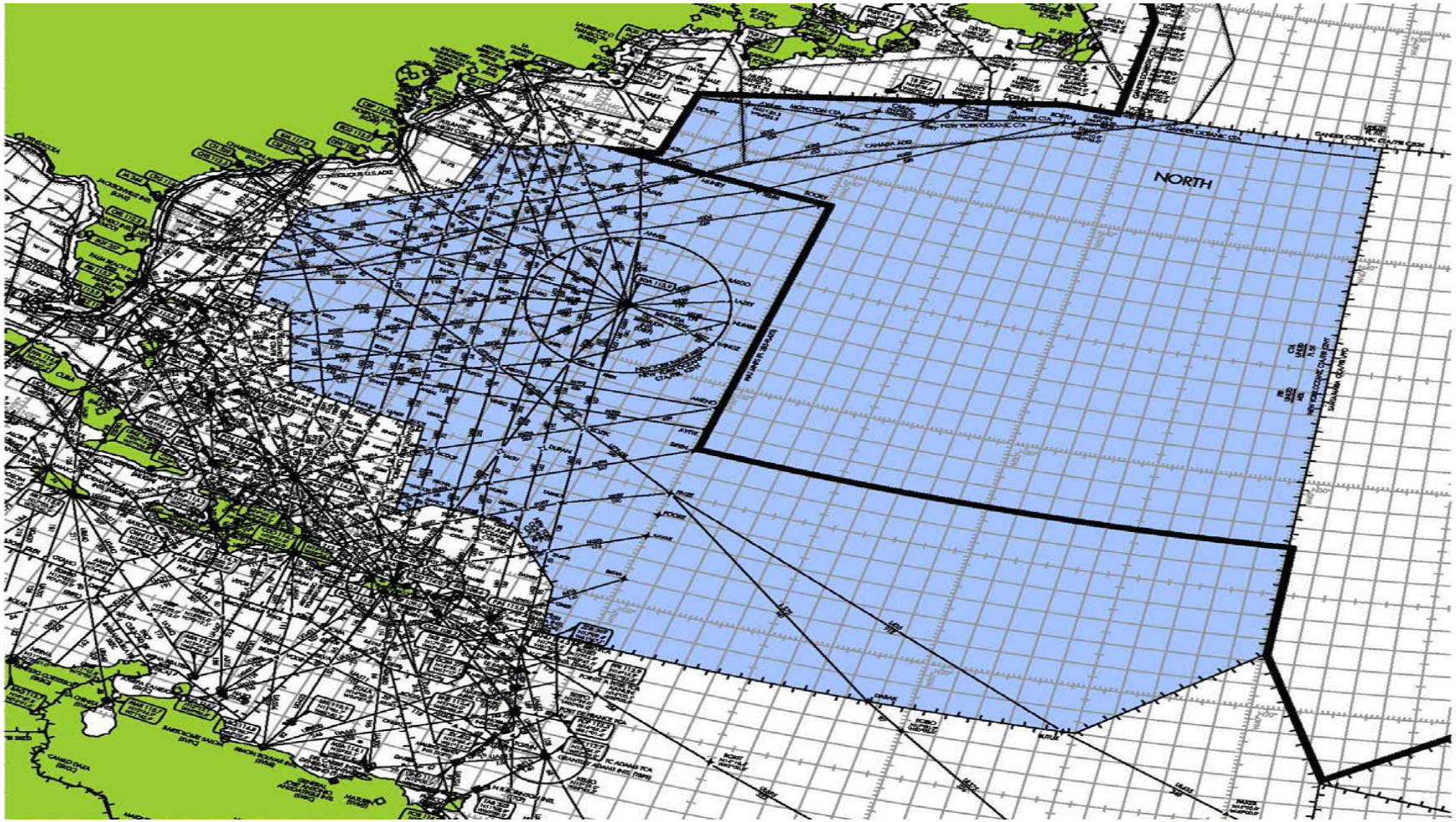
Who Are We?

FAA
Air Traffic Organization

FAA United States Managed International Airspace



New York Oceanic



New York Center – Then and Now

Then:

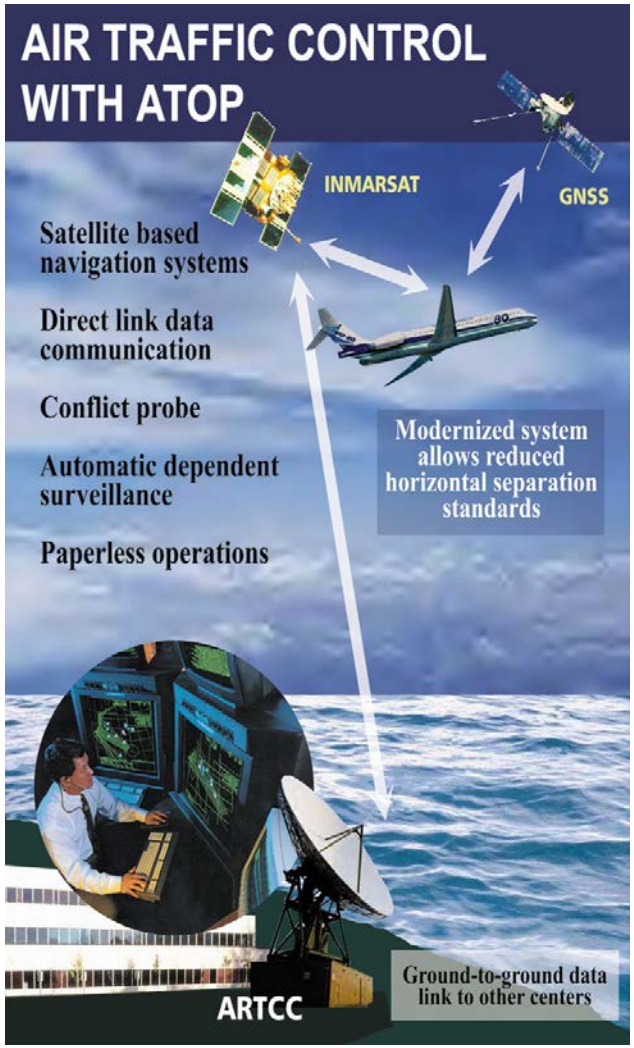
- Lack of Integrated Tools and Flight Data.
- Time-Intensive Process to Access and Calculate Information for Decision Making
- New System Operational on June 5, 2005.

Now:

- Utilizes Advanced Technologies and Oceanic Procedures (ATOP) System.
- Similar Systems are Currently in Use by Santa Maria ACC and Reykjavik ACC.

ATOP Functionality Today

- Complete 4D Profile Protection in Oceanic Airspace
- Automated Conflict Detection for All Oceanic Separation Standards
- Monitoring and Control by Exception
- Separation Criteria Based on Individual Aircraft Performance and Equipage
- Full Integration of RADAR and non-RADAR Traffic
- Supports all ICAO flight plan messages
- RADAR Data Processing



- Dynamic Airspace Allocation
- Satellite based Controller Pilot Data Link Communication (CPDLC)
- Satellite based Automatic Dependent Surveillance – Contract (ADS-C)
- Automatic Dependent Surveillance-Broadcast (ADS-B)
- Paperless Environment
- Automatic Weather Dissemination
- Air Traffic Services Inter-facility Data Communications (AIDC)

ATOP ATCO Buy-In

NATCA/FAA MOU on participation in development & deployment of oceanic projects, including ATOP

Objectives

- Controller involvement in evaluation of procedures/service level for operation
- Agreement on modifications
- Assures FAA allocates resources to support level of involvement (Time off position)
- Provides NATCA & AT representatives to the Ocean IPT Serve as National Team Coordinators for AT Site Product Team (SPT) & ATOP Product Team (PT) activities
- Establishes SPTs at ZOA, ZNY & ZAN NATCA & Management Leads for each site SPT Scope & authority of SPT defined in appended SPT Charter
- Stresses importance of participant consistency through program completion

ATOP Evaluation Process

Significant insight very early-on of systems and procedures

Thousands of staff hours of hands-on operational and proposal evaluation by controllers, technicians, automation specialists and subject matter experts resulted in:

- **Buy-in from key Unions**
- **Definition of Concept of Operations and Use**
- **Draft Operational Procedures**
- **Identification of customization required for the NAS**
- **Common understanding of the scope of the effort**

Air Traffic Considerations

AT Evaluation Factors

CHI, functionality, workload, situational awareness, workstation design ergonomics
Comparison against today's job/task analysis

Human Factors Considerations

FAA user team assessments during evaluations
Human factors guidelines used in task performance suitability
AT and AF CHI Teams

SPTs were integral part of system engineering, test and implementation processes

Air Traffic Considerations Cont.

Concept of Operations is Control By Exception.

- Only information that requires action is presented to the controller. For example, an Out of Conformance Position Report.
- Controller is prompted when coordination is required and when it is overdue.
- ATOP continually compares the cleared profile against the coordinated profile and warns the controller of discrepancies

Partnership Results

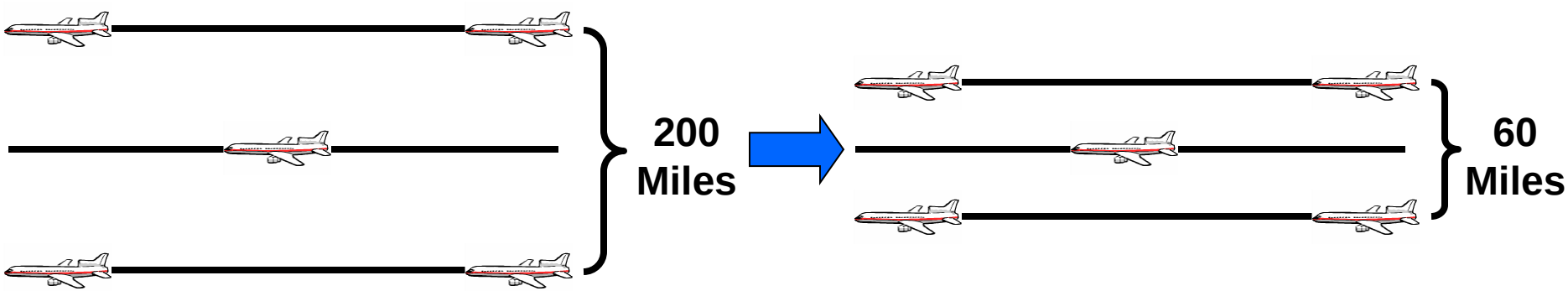
Reduced Lateral and Longitudinal Separation Standards

30/30 and D50

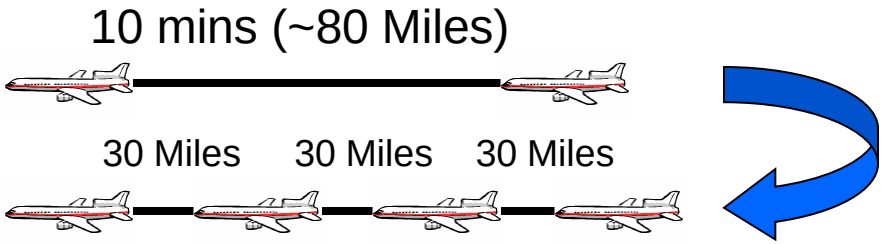
- On 10 December 2013, the United States reduced the ***lateral*** spacing between ADS-C and CPDLC connected RNP-4 aircraft operating in the entire New York Oceanic CTA from 50 NM down to 30 NM.
- Additionally, the ***longitudinal*** spacing of these same aircraft was reduced from 80 NM down to 30 NM.
- The ***longitudinal*** spacing of ADS-C and CPDLC connected RNP-10 aircraft was reduced from 80 NM down to 50 NM.

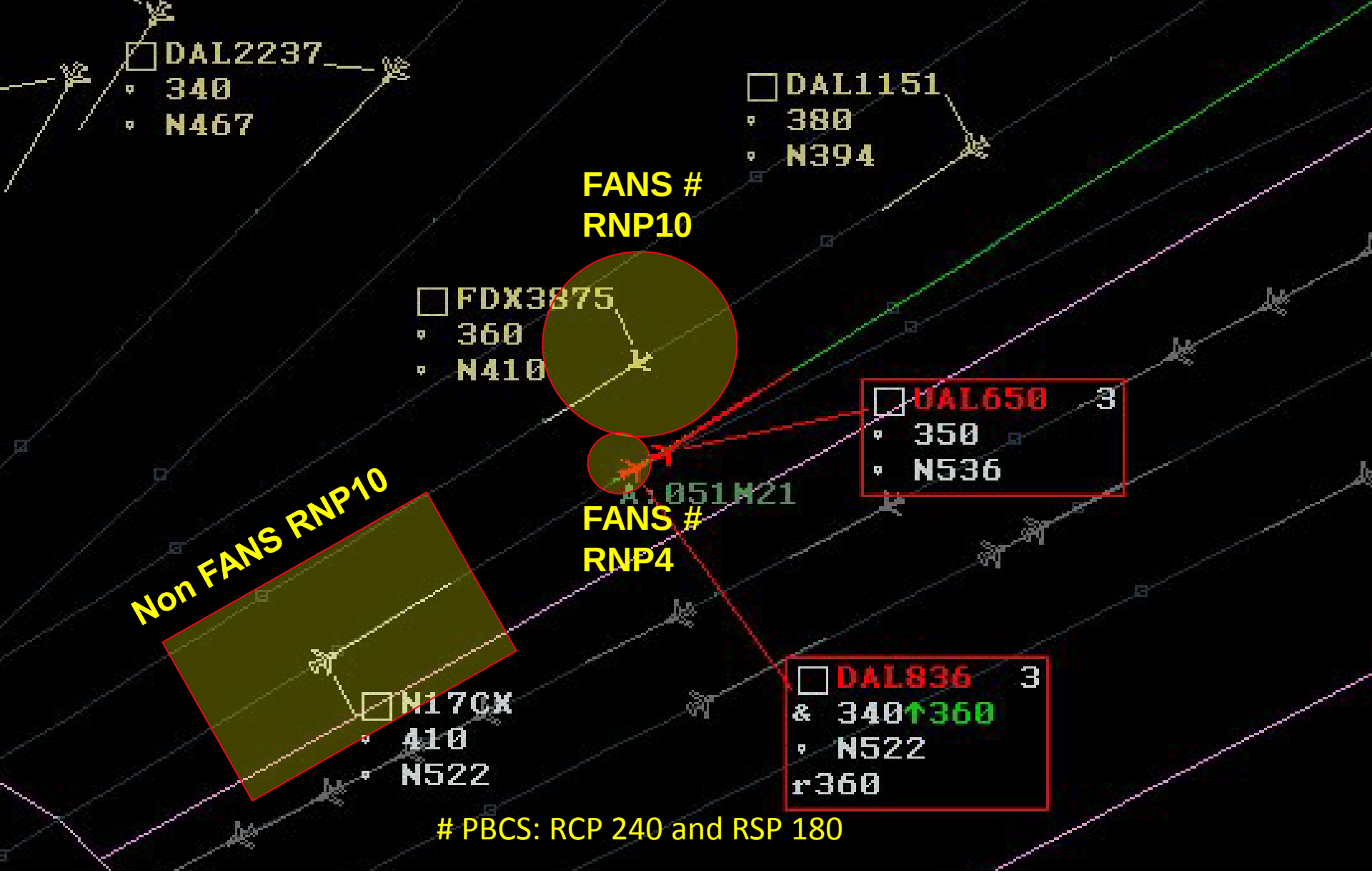
30/30/D50 Graphical Depiction

Lateral Separation



Longitudinal Separation





PBCS: RCP 240 and RSP 180

ATOP Improved Efficiencies Using 30/30/D50

- As a result of these reductions, altitude requests which were previously denied due to traffic are now being granted.
- We are now able to accommodate more altitude, WX deviation and route requests.
- The use of 30/30 and D50 also enable us to transition aircraft to altitudes that other ANSPs may require due to traffic in their FIR.
- This has resulted in greater efficiency for both the provider (KZWY) and the user.

Overall System Results

- Best Equipped-Best Served
  - RNP4/10 and FANS-1/A PBCS aircraft receive better routes, altitudes, WX deviations, etc
- Greater Flexibility
  - More planes are able to fly their preferred routes
- Greater Capacity
  - Automation handles all of the tasks that once had to be manually done.
  - Allows controller to handle more aircraft with less effort

Response times to aircraft requested have dropped dramatically. Average response time in now 2.7 minutes for HF aircraft and less then two minutes for CPDLC aircraft

Planned ATOP System Enhancements

In the first half of CY2016, two new system capabilities was introduced that will enable the further reduction of longitudinal separation to as little as 15NM for aircraft climbing or descending through the altitude of another. These capabilities are:

ADS-C Climb/Descent Procedure (CDP)

ADS-B In Trail Procedure (ITP)

The following provides details about each function, which will illustrate one main and important difference between the two.

ADS-C Climb/Descent Procedure (ADS-C CDP)

ADS-C Climb/Descent Procedure (CDP)

- **Climb/descent procedure when less than standard separation exists**
  - Aircraft on same track
  - Difference between CDP and blocking aircraft 2000ft. or less
- **Minimum of 15 nautical miles (NM) longitudinal separation**
  - 25 NM at initiation for faster aircraft in back (no more than 0.02M)
- **Requires CPDLC and position report accuracy of 0.25 NM or better (Figure of Merit 6 or higher)**
- **Controller-initiated procedure**
  - Climbing/descending and blocking aircraft may see aircraft at less than standard separation
- **ATOP designed to check for required minima ICAO State Letter with ADS-C CDP proposal currently out for comment**
  - Expected publication in November 2016

ADS-B In Trail Procedure (ADS-B ITP)

- **Climb/descent procedure when less than standard separation exists**
  - Aircraft on same track
  - Difference between ITP and reference aircraft 2000ft. or less

- **Minimum of 15 nautical miles (NM) longitudinal separation at procedure initiation**
  - Doc. 4444 minimum is 10 NM.
  - 15 NM used to account for compression during climb/descent

•Pilot requested/initiated procedure

•Requesting aircraft equipped with ADS-B in/out and controller pilot datalink communication (CPDLC)

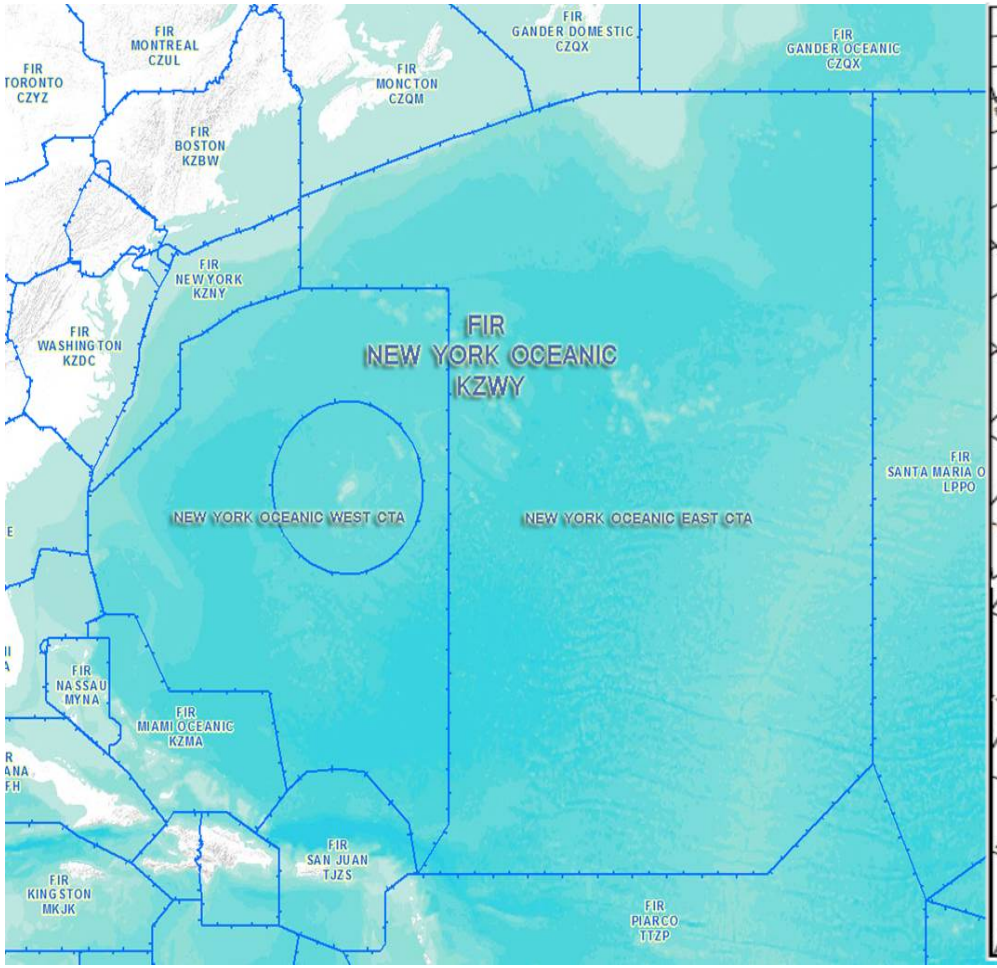
•ATOP verifies speeds to check for overtake situations

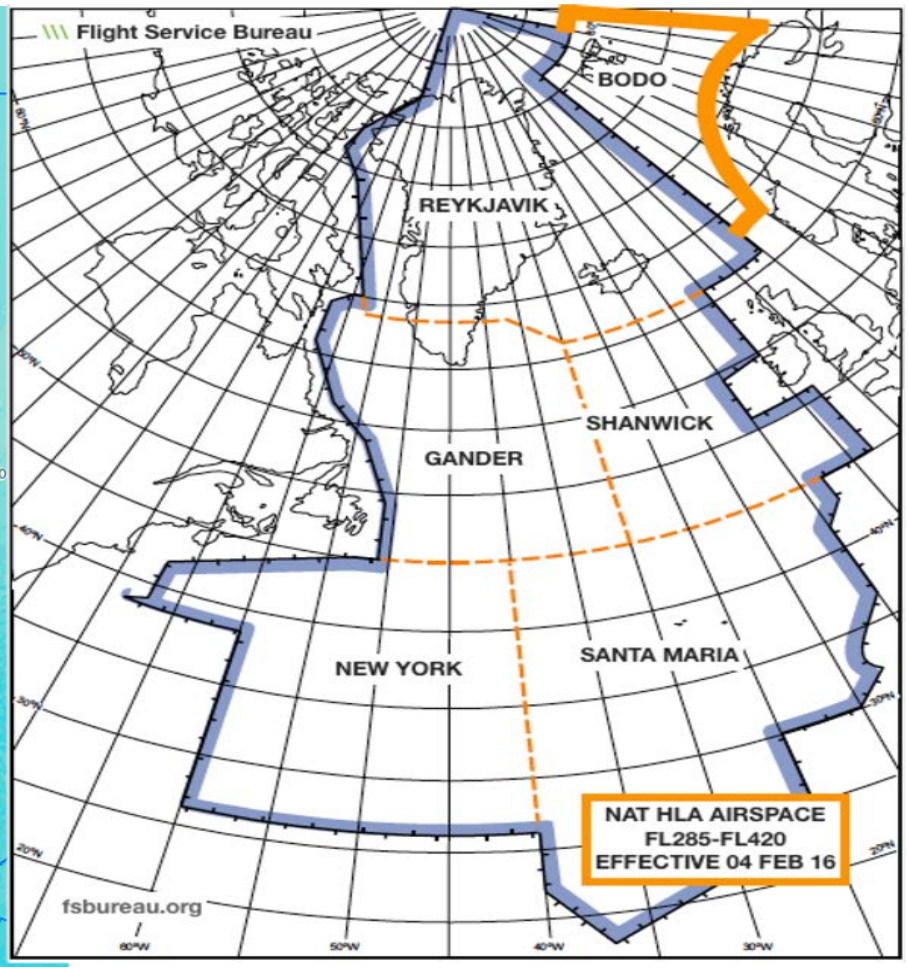
•Ref. PANS-ATM Doc. 4444 5.4.2.7; FAA AC 90-144A

DARP Procedures

- DARP - Dynamic Airborne Reroute Procedures – are offered to all Datalink equipped aircraft within the KZWY FIR.
- Operating Procedures for DARP are outlined in the ICAO Global Operational Data Link Document (GOLD), Chapter 6
- Route/Altitude changes to achieve optimal profile provided upon request from the flight deck and fulfilled based on current traffic situation and adjacent facility coordination agreements.
- Reroute requests normally received via Downlink Message (DM) 24, and must either tie into the original route or provide an entire new route to destination.
- Route changes that include latitude/longitudes must be sent in standard format (xxxxN/xxxxxW)
- Standard route clearance messages (UM) 79/80/83 will be used to send the clearance, depending on the extent of the change.

New York Oceanic KZWY- North Atlantic

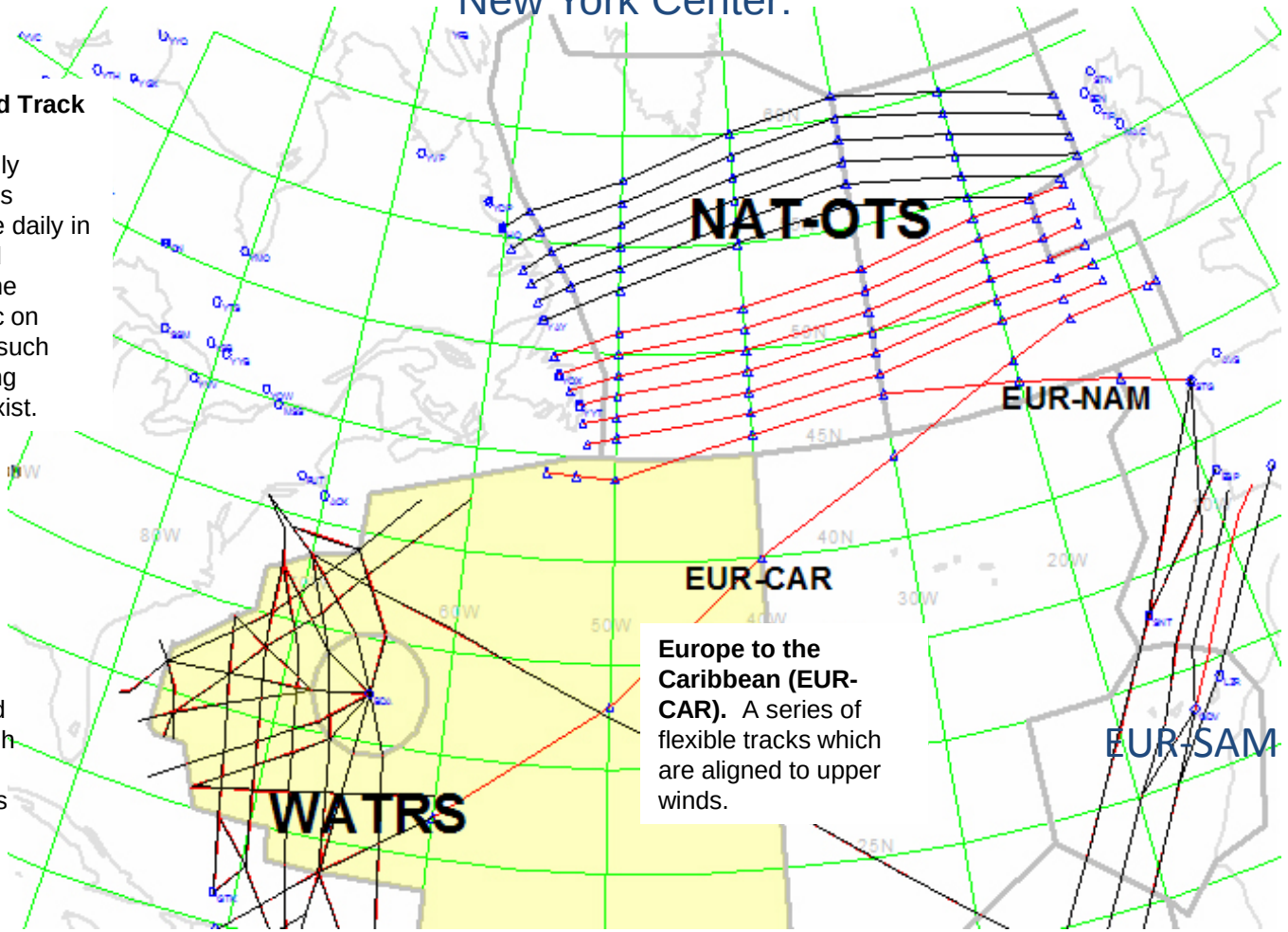




Atlantic Operations

4 distinct traffic flows affect US Atlantic oceanic operations, controlled from New York Center:

NAT Organized Track System (OTS). A series of highly organized tracks generated twice daily in the light of wind information. The density of traffic on these tracks is such that few crossing opportunities exist.



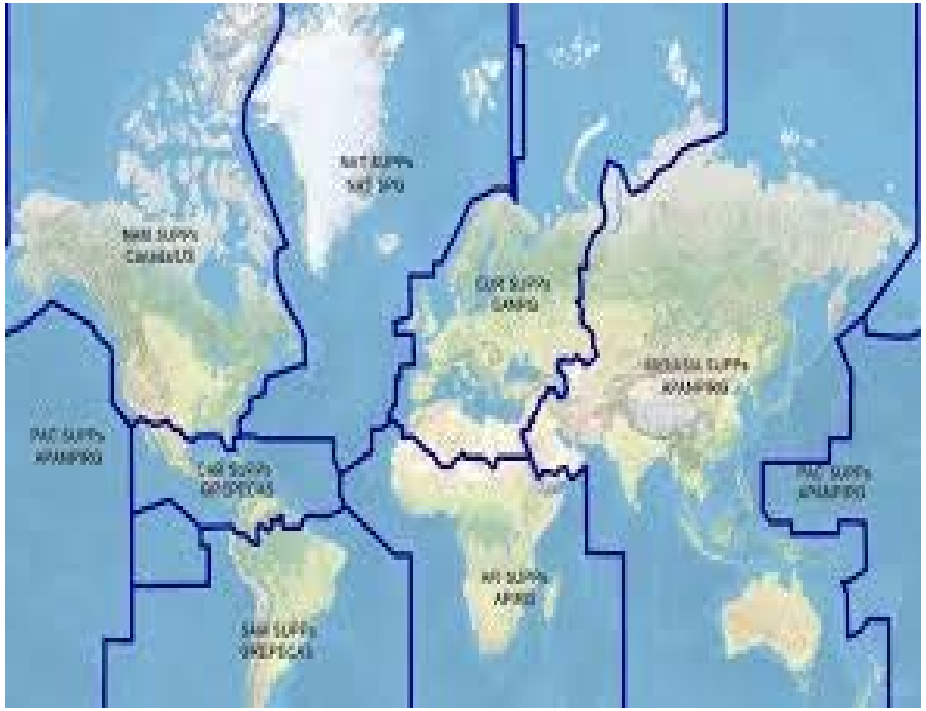
Europe to North America (EUR-NAM). Random tracks are used which can become more complex due to the random nature of the crossing tracks.

Western Atlantic Route System (WATRS). A fixed set of tracks of high complexity which experiences peaks of high traffic density.

Europe to the Caribbean (EUR-CAR). A series of flexible tracks which are aligned to upper winds.

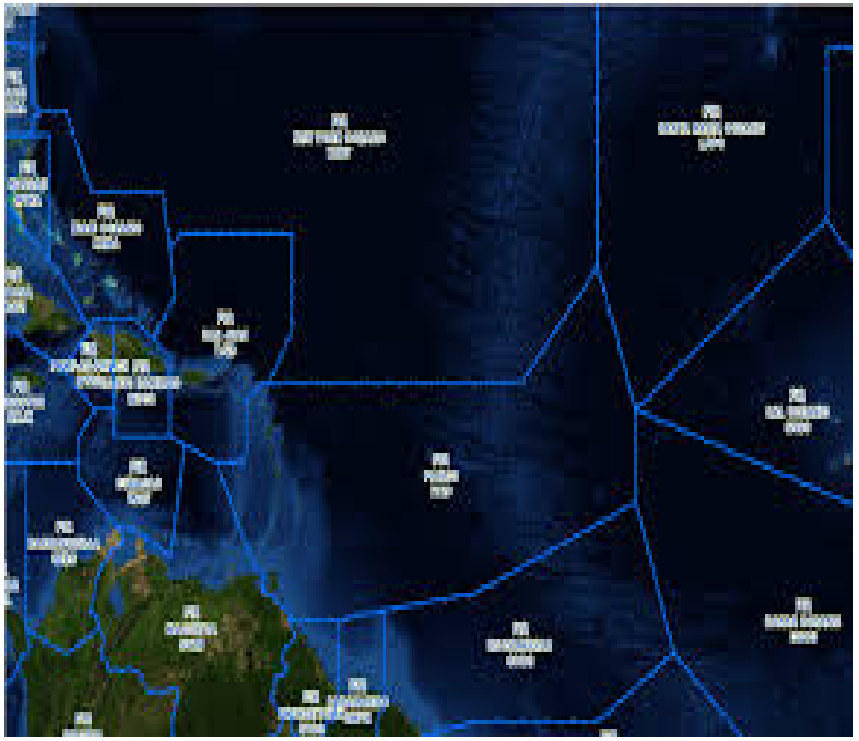
Europe to South America (EUR-SAM). A fixed set of tracks of high complexity which experiences peaks of high traffic density.

South Atlantic Organizational Structure



ICAO Alignment of ANPs and SUPPs do not recognize the SAT as Oceanic Service Providers.

The NAT and SAT share common service provision as well as borders.



Current NAT Initiatives

On November 12, 2015, Gander ACC and Shanwick ACC will begin Phase one of Reduced Lateral Separation Minima (RLatSM) spacing between three identified tracks.

•In the first quarter of 2016, MNPS airspace will begin the transition to a new airspace definition called High Level Airspace. All applicable ICAO NAT region documentation will be appropriately updated.

NAT Data Link Mandate

- The objectives of the NAT DLM are to enhance communication, surveillance and ATC intervention capabilities in the NAT Region in order to reduce collision risk and enable the NAT Target Level of Safety to be met, particularly in the vertical plane.
    - ADS-C provides capabilities for conformance monitoring of aircraft adherence to cleared route and FL, thereby, significantly enhancing safety in the NAT Region.
    - ADS-C also facilitates search and rescue operations and the capability to locate the site of an accident in oceanic airspace.
    - CPDLC significantly enhances air/ground communication capability and, therefore, controller intervention capability.
- Objectives are that by 2018, 90% of aircraft operating in the NAT region airspace at FL 290 and above will be equipped with Future Air Navigation Systems 1/A (FANS 1/A) (or equivalent) ADS-C and CPDLC systems and that by 2020, 95% of aircraft operating in that airspace, will be so equipped.

NAT Data Link Mandate Cont.

- **NAT DLM Phase 1.** The first phase of the mandate for data link services in the North Atlantic (NAT) Region **commenced 7 February 2013**. As of that date, all aircraft operating on or at any point along two specified tracks within the NAT organized track system (OTS) between FL360 to FL390 (inclusive) during the OTS validity period are required to be fitted with and using FANS 1/A (or equivalent) CPDLC and ADS-C equipment.

- **Phase 2B Commencing 7 December 2017:** FL350-FL390 (inclusive) throughout the ICAO NAT Region;

- **Phase 2C commencing 30 January 2020:** FL290 and above throughout the ICAO NAT Region.

Questions?