Automation Interface Update
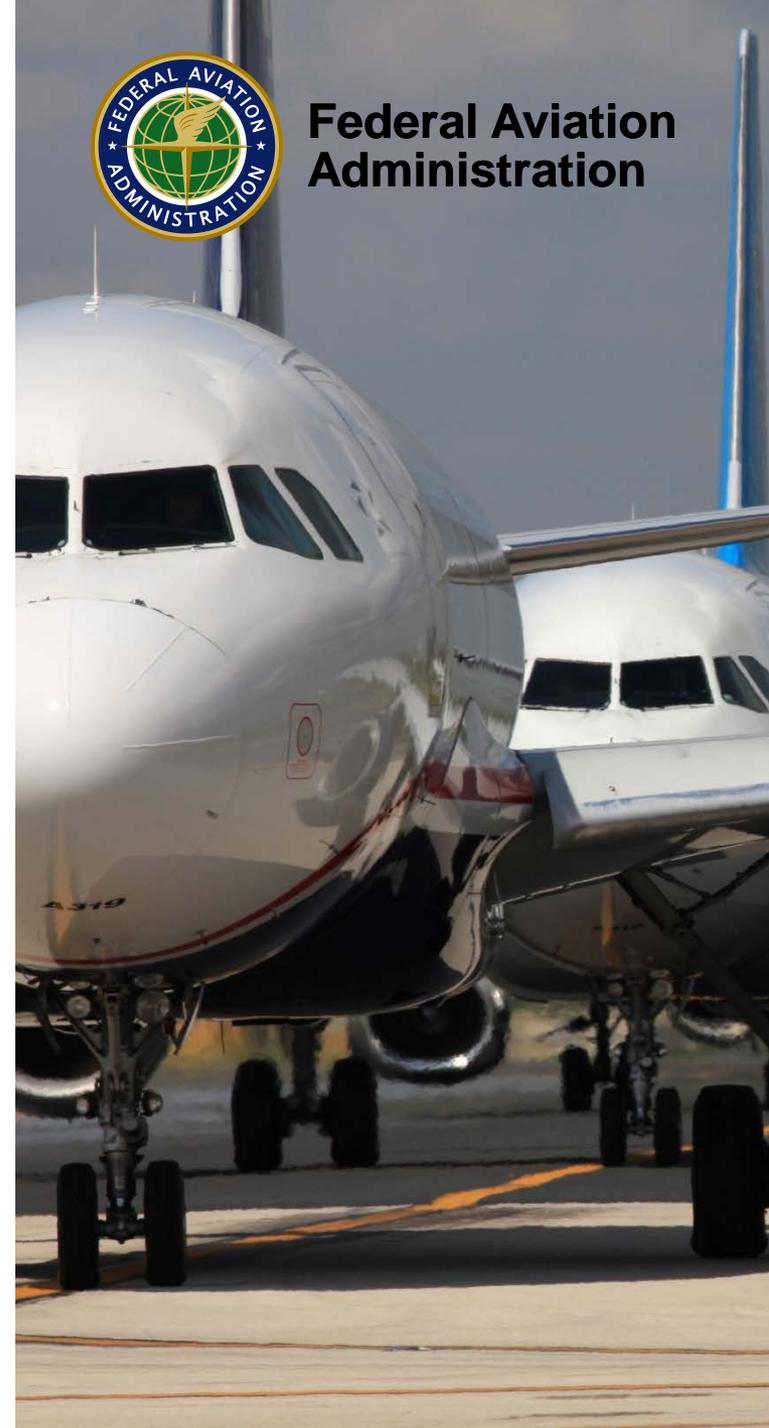
Federal Aviation Administration

Presented To: ICAO ANI/WG3

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Introduction

- The FAA provides air navigation services to over 29 million miles of domestic and international airspace with approximately 43 million aircraft handled annually.

- Operations across international boundaries can be based on domestic en route radar separation procedures, as is the case along most of the U.S. border with Canada, Mexico, Cuba and the Caribbean.

- Oceanic operations within international airspace and international boundaries can be based on non-radar procedural or Automatic Dependent Surveillance (ADS) separation, such as the oceanic operations at New York, Oakland and Anchorage Center.

Harmonization is Goal – 'One North America'

- Support for bilateral solutions and user collaboration needed to ensure automation compatibility as interface systems evolve

- Solutions must provide extensible compatibility with our North American and international neighbors

- Goal is to extend operational efficiencies through contiguous computer-to-computer coordination across country and system boundaries

- Direct benefit on our collective ability to integrate new technologies by providing 'automation buyback' for new controller tasks
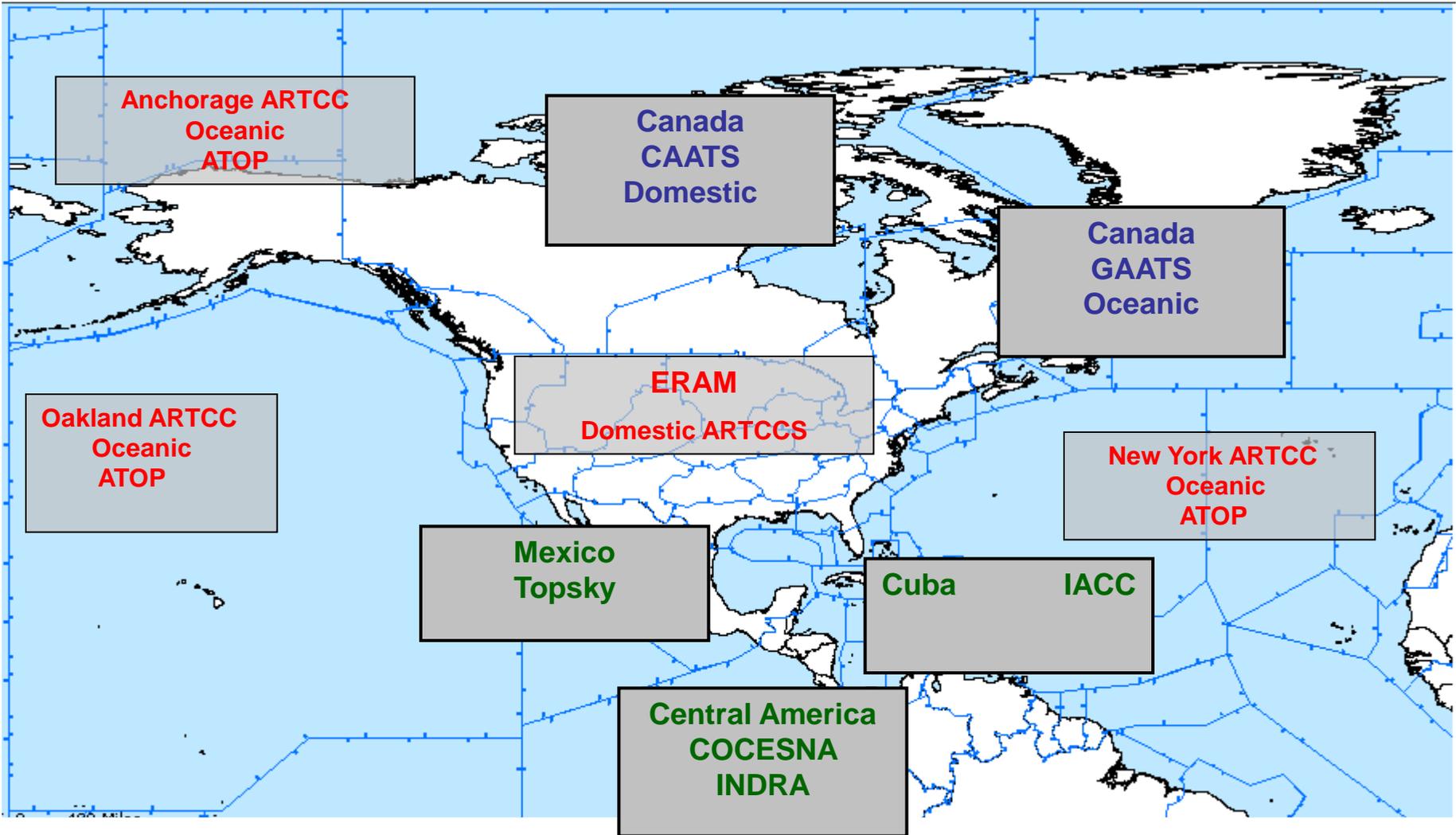
NAM Cross Border History

- Within North American Aviation Trilateral (NAAT/5) Canada, Mexico & U.S. agreed to cooperate on development of **seamless** interface between countries and automation systems
  - Focus on automated exchange of ICAO flight data with goal being 'voiceless' handoff between countries
- NAM ICD defines message formats for implementation of interfaces between automation systems
- NAM Interfaces
  - U.S. & Canada 2009
  - U.S. & Mexico 2008
  - Cuba added 2011

- Same standard used as guide for Caribbean flight data automation compatibility

  - International neighbors installing new systems look to maximize benefits of their automation investment

  - Cuba interfaced with Merida Mexico Jan 2012

  - COCESNA interfaced with Merida and Havana in 2015

Automation

- The increasing demand of international traffic between Flight Information Regions (FIR) drives the need to improve efficiency and maintain the data accuracy for the Air Traffic Control (ATC) providers.

- Developing a harmonized process and using standardized protocols for exchanging data between multiple States/Territories/ International Organizations within and across regions is critical to achieving efficiency through automation.

- Infrastructure needs and wants is a critical factor as projects compete for the same funding

NACC En Route/Oceanic Automation

Anchorage ARTCC
Oceanic
ATOP

Canada
CAATS
Domestic

Canada
GAATS
Oceanic

ERAM
Domestic ARTCCS

Oakland ARTCC
Oceanic
ATOP

New York ARTCC
Oceanic
ATOP

Mexico
Topsky

Cuba   IACC

Central America
COCESNA
INDRA

Border Crossings

- **Five of the top six US shared NACC borders have the highest traffic levels**

US International Border Crossings				
Neighboring FIR	CY 2012 Number of crossings	CY 2013 Number of crossings	CY 2014 Number of crossings	Estimated 2015 Number of crossings
Canada FIRs	2,489,122	2,513,329	2,556,999	2,600,669
Mexico FIRs	390,280	402,499	413,821	425,143
Habana	230,212	233,922	241,641	249,360
Japan	125,961	130,515	133,490	136,465
SantoDomingo	88,751	92,715	101,822	110,929
Piarco	79,640	81,027	85,000	88,973
SantaMaria	72,281	73,459	76,726	79,993
PortAuPrince	46,090	47,978	49,886	51,794
Russia FIRs	39,665	39,894	40,365	40,836
Maiquetia	11,948	13,536	13,338	13,536
Port Moresby	10,721	10,672	10,770	10,868
Auckland Oceanic	6,463	7,250	7,580	7,910
Curacao	6,054	5,941	6,519	7,097
Manila	5,794	5,565	6,184	6,803
Nadi	2,703	2,941	3,104	3,267
Tahiti	2,984	2,571	2,791	3,011
Nauru	552	609	618	627
Ujung Pandang	255	224	235	246
Grand Total	3,609,476	3,664,647	3,750,889	3,837,131

U.S. NAM Domestic İnterfaces
Canada, Mexico and Cuba

US Automated Boundaries

- US Operational Interfaces within NACC (green shading) totals indicated; 20 NAM and 2 AIDC

| Neighboring FIR(s)	Operational Interfaces	NAM	AIDC	Pending
Canada FIRs	15	14	1	2
Mexico FIRs	6	5	1	
Habana_FIR	1	1		
Japan_FIR	2		2	
SantoDomingo_FIR				1
Piarco_FIR				1
SantaMaria_FIR	1		1	
PortAuPrince_FIR				
Russia_FIR				
Maiquetia_FIR				
Port_Moresby_FIR				
Auckland_Oceanic_FIR	1		1	
Curacao_FIR				
Manila_FIR				
Nadi_FIR	1		1	
Tahiti_FIR	1		1	
Nauru_FIR	1		1	
Ujung_Pandang_FIR				
* Note Alaska and Oakland have an AIDC connection	1		1	
Grand Total	30	20	10	4

North American Common Interface Control Document (NAM ICD)

- NAM Cross Border Automation has been implemented between 23 NACC FIRs in US, Mexico, Canada, Cuba and Honduras (COSESNA), providing the opportunity for seamless interfaces between adjacent ATC systems. Operational NAM ICD Interfaces Include:

  - Canada – US – 14
    - Domestic 11
    - Alaska   2
    - Oakland Oceanic (ATOP) - Vancouver ACC

  - Mexico - 7
    - US 5
    - Cuba
    - COCESNA

  - Cuba – 3
    - US -Miami
    - Mexico (Merida)
    - COCESNA

  - COCESNA - 2
    - Mexico (Merida)
    - Cuba (Havana)

Automation Infrastructure

- Air Traffic Service (ATS) Interfacility Data Communications (AIDC), North American Common Coordination Interface Control Document (NAM ICD) and the custom NAS protocols provide the means for automated data exchange both domestically and internationally.

  - AIDC
  - NAM
  - NAS

- These three protocol sets utilize the contiguous automation infrastructure for ATS automated data exchange between adjacent FIRs.

- A communications and data interchange infrastructure significantly reduces the need for verbal coordination between Air Traffic Service Units (ATSUs) delivering more efficient and streamlined services.
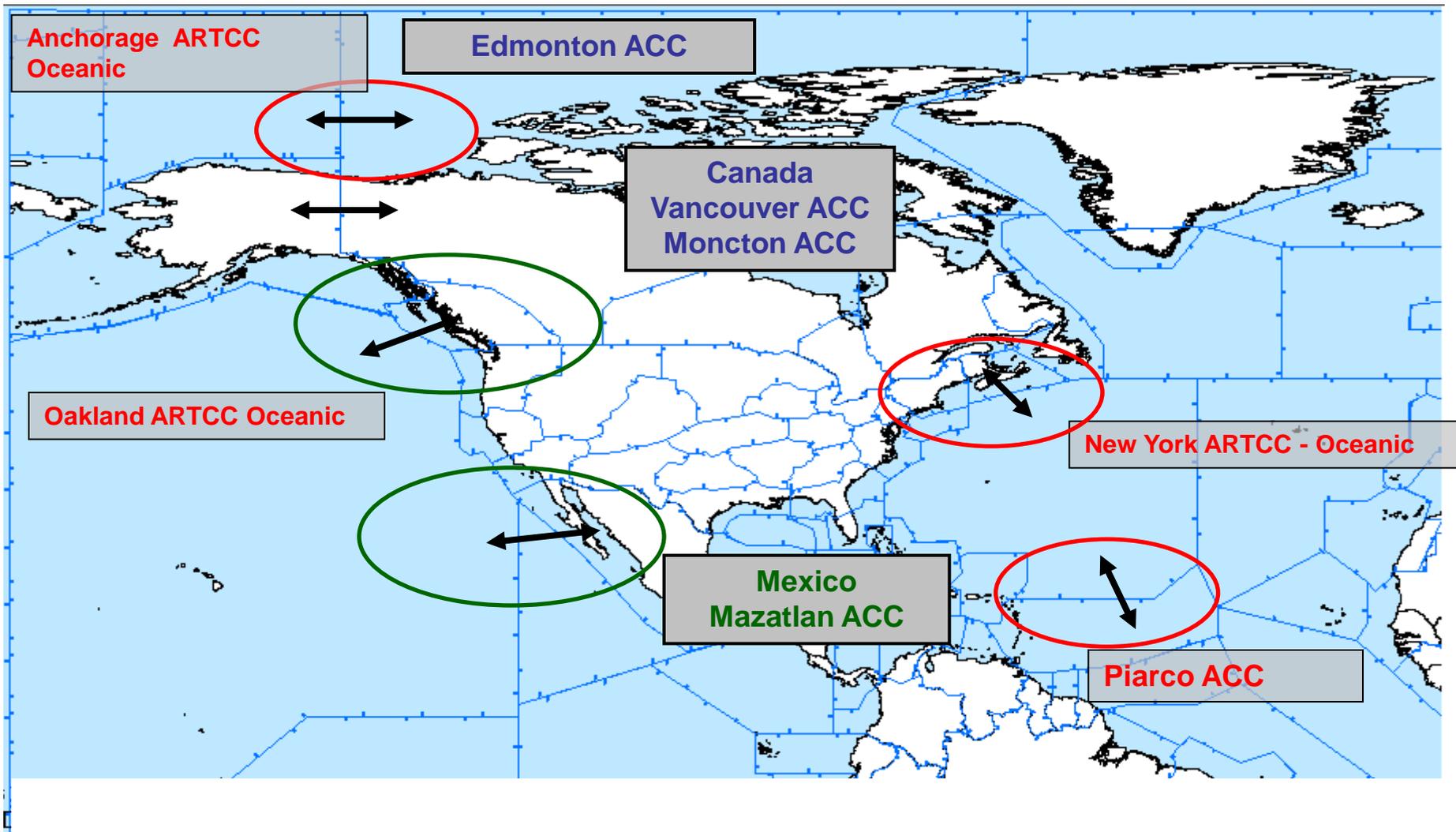
Automated International Boundaries
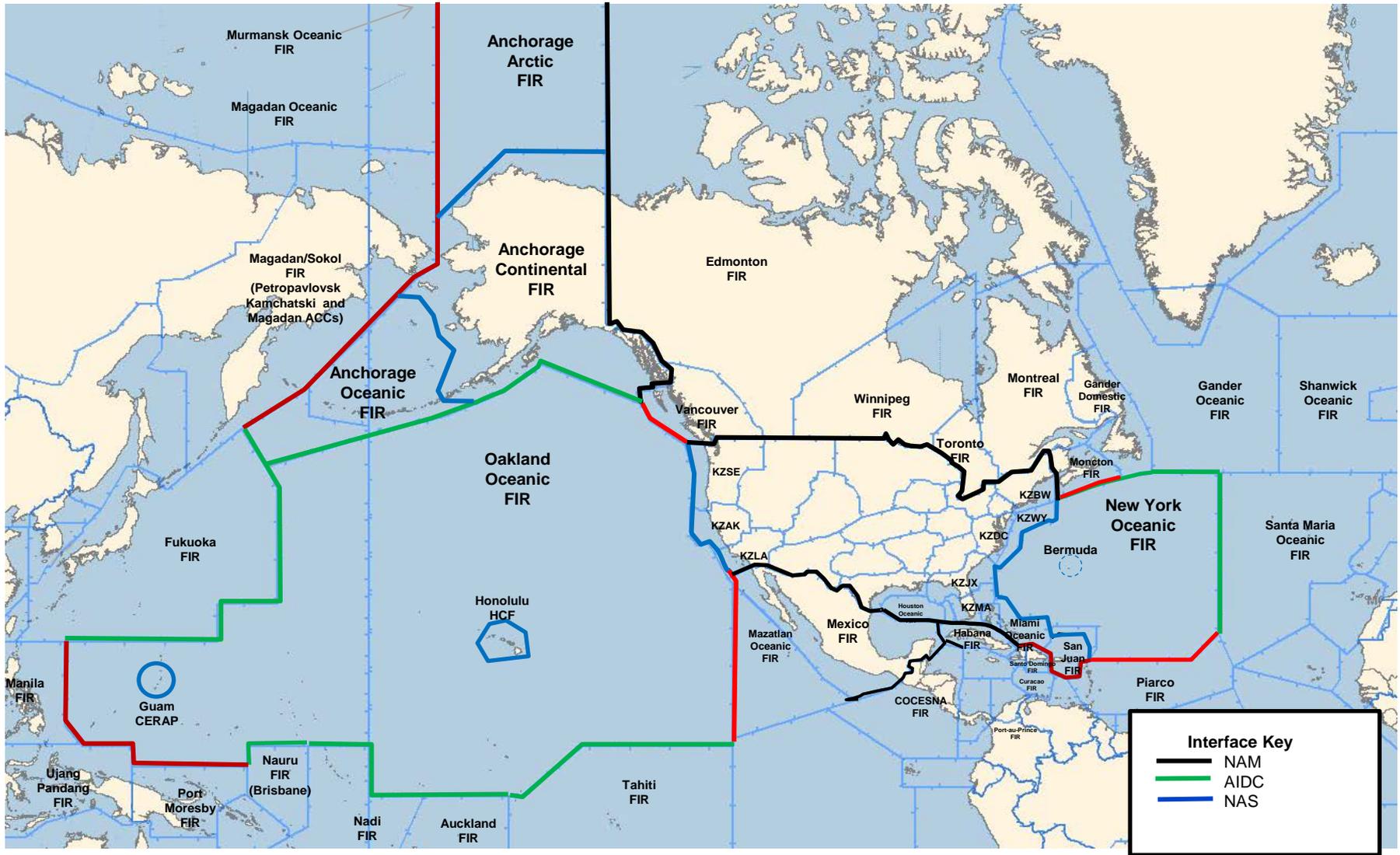
Working the 'Red' Interfaces

- In 2015 Oakland Oceanic's ATOP was interfaced with the Vancouver CAATS making it the first ATOP NAM ICD Class 2 interface.

- In 2015 Oakland Oceanic's ATOP was interfaced with the Mazatlan ACC Topsky system using the AIDC protocol.

- The US and Canada are also working the interface of New York Oceanic's ATOP with Moncton ACC CAATS using the NAM ICD protocol.

- New York Oceanic is also working toward implementing an AIDC interface with Piarco ACC. San Juan and New York Oceanic have borders with Piarco.

2015 & 2016 US Interface Initiatives
En Route/Oceanic Systems

Anchorage ARTCC Oceanic

Edmonton ACC

Canada
Vancouver ACC
Moncton ACC

Oakland ARTCC Oceanic

New York ARTCC - Oceanic

Mexico
Mazatlan ACC

Piarco ACC

NACC Interface Environment

- In most NAM environments, radar is the operational norm and non-radar the exception ……where in many traditional AIDC interfaces non-radar is more the norm and radar is the exception.

- The NAM messaging is used throughout North America and may be likened to the domestic protocol such as European Online Data Interface (OLDI). The NAM protocol provides the advantage of extensibility to radar handoff and point-out functionality, enhancing a positive controlled radar environment.

- The NAM ICD has defined automated radar handoff messaging definitions within the document as a goal of cross-border interoperability evolution.

- Full AIDC capability also supports extended equipment capabilities in time, altitude and distance based operations where different separation minima are being used in adjacent airspace.

Caribbean NAM ICD Interfaces
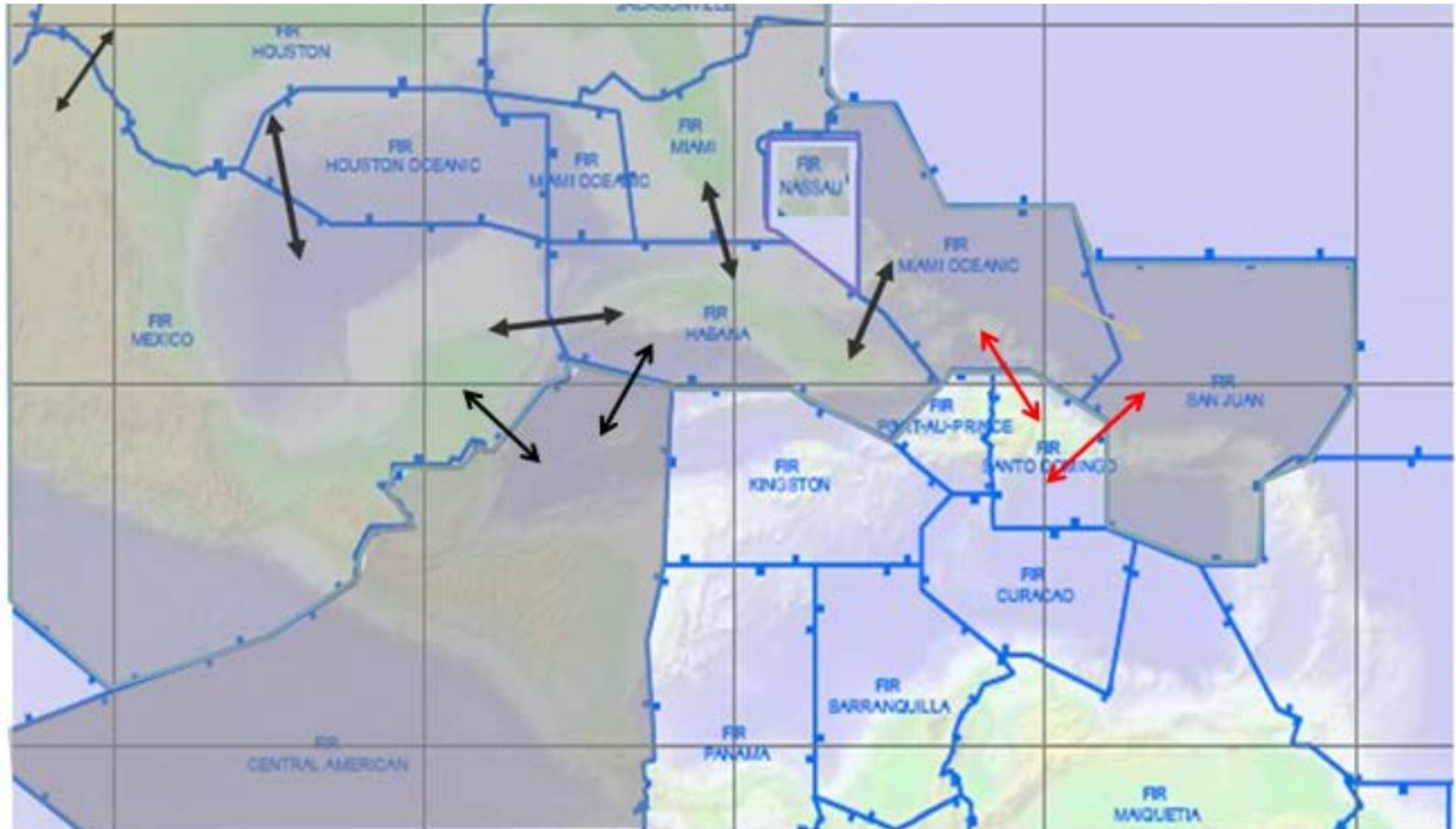
Extending the Automation Standard

- Compatibility management between existing/emerging international automation systems is essential to optimize capabilities and meet user needs
- U.S. centralized geographic position requires active participation to assure compatibility is maintained
- Besides the ICAO North American, Central American Caribbean (NACC) Region, the FAA also participates in Caribbean & South American (CARSAM) ATC automation ICD development
- Countries interested in extending interfaces with the U.S. to include automated radar handoff
  - Dominican Republic
  - Bahamas
  - Cuba
  - Canada

Using AIDC and NAM in Automated Data Exchange

- AIDC functionality described Asia Pacific and North Atlantic ICDs; now PAN ICD
  - Provides the needed guidance for messaging, coordination and transfer to support non-radar/procedural environments such as oceanic operations.
  - It can be confusing when these primarily domestic environments such are referred to as AIDC.
- The NAM ICD is currently used in North American FIR boundary operations, in domestic/oceanic transition areas and in surveillance environments.
  - Many times operations do not fit neatly into one category protocol or the other
  - Many systems today will allow interface protocols to be tailored to a particular interface; NAM or AIDC, systems also support both .
- A full set of messages may not be needed to achieve automated flight data exchange for a particular interface.
  - Protocols which can support incremental levels of functionality provides tremendous implementation flexibility; AIDC and NAM are used in US International interfaces
  - Supports a reduced set of interface messages

Lessons Learned

- The operational environment should always be examined when formulating the strategy for the project. In analysing a proposed interface, the following factors should be considered:

  - A determination is needed of which system protocols are already being used in bordering FIR interfaces or what protocols adjacent systems are capable of supporting. If a significant systems investment is required by a potential interface partner in support of a unique adjacent interface, the effort may never happen. It is very important that achievable automation decisions be made

  - Analysis FIR operation is needed; radar to radar interface, a non-radar to non-radar interface or radar to non-radar should be examined.

  - To provide the most effective automation between FIRs, operational environment matching with the proper automation protocol is needed to field a successful interface.

  - System needs coupled with current and new system capabilities/limitations should also be factored into the interface protocol decision.

- Additionally, the FAA believes that partnering with an adjacent facility who already has operational interfaces using the same protocol NAM or AIDC can also lead to a successful, timely implementation. In the absence of FIR–FIR interface experience, regional expertise may be an option.

Conclusion

- Safety and efficiency interests extend beyond the borders of our airspace and systems. Operational efficiencies gained in our airspace should be continuous to the extent possible as aircraft travel into other regions and service providers.

- Taking a harmonized approach with our En Route and Oceanic systems extends our capabilities

- As our aircraft operators invest in aircraft technology, they expect it to be compatible with systems and procedures used by other air navigation service providers.

- Standardization of automated data exchange technologies and procedures is critical to cross-border, regional and multi-regional interoperability. This, in turn, drives the seamless operation of regional and global systems.

- Harmonization supports safety objectives through standardization and promotes economic efficiencies. A harmonized system cannot be built without developing partnerships with our international counterparts.