

North American (NAM) Common Coordination Interface Control Document (ICD)

Presented To: Go-Team Meeting
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**Federal Aviation
Administration**



North American Common Interface Control Document (NAM ICD)

- Within the North American Aviation Trilateral (NAAT/5) Canada, Mexico, and US agreed to cooperate on development of a seamless interface between automation systems, focusing on automated exchange of ICAO flight data. Radar/surveillance operations is the key environment targeted by the NAM ICD protocol
 - NAM ICD was based on ICAO 4444, North Atlantic Common Coordination ICD and Pacific Common Coordination ICD
 - ICD outlines current and long-term guidelines for harmonized development of automation systems
 - ICD is designed as a living document that will be updated to reflect the needs of the member states
- Automation interfaces in Mexico, Canada, Cuba and Dominican Republic offers opportunity for utilizing enhanced interfaces to FAA's En Route Automation Systems



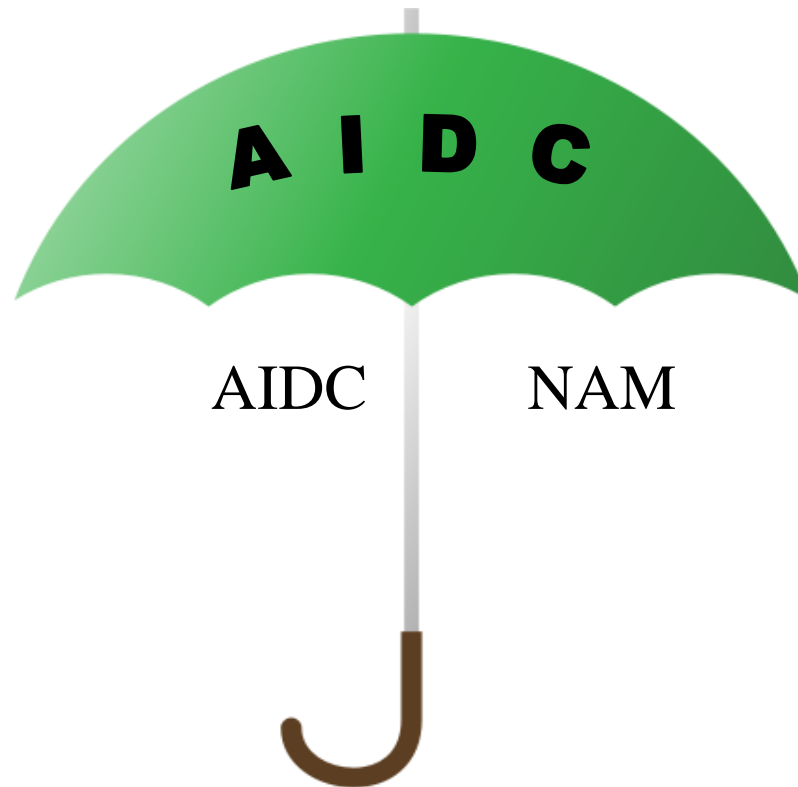
Cross Border Automation - Operational Benefits

- Automated Flight Data Exchange Replaces Manual
 - Reduced controller manual coordination at border sectors
 - Less phone time = more time separating aircraft
 - Increased Safety
 - Flight data automation reduces manual cross-border coordination and makes remaining coordination more reliable reducing risk of language misunderstandings
- Additional ICAO Flight Plan Format Benefits Derived
 - Enables more comprehensive description of aircraft equipment to support advanced navigation automation and decision making to include supporting RVSM, RNP, ADS-B and RNAV preferential route processing
 - Provides basis for upgrading radar/surveillance capabilities between interface partners



ATS Interfacility Data Communication (AIDC)

- In the North American, Central American and Caribbean (NACC) Region **AIDC** and **NAM** protocols are used in AIDC Technology interfaces. **NAM** supports radar handoffs.



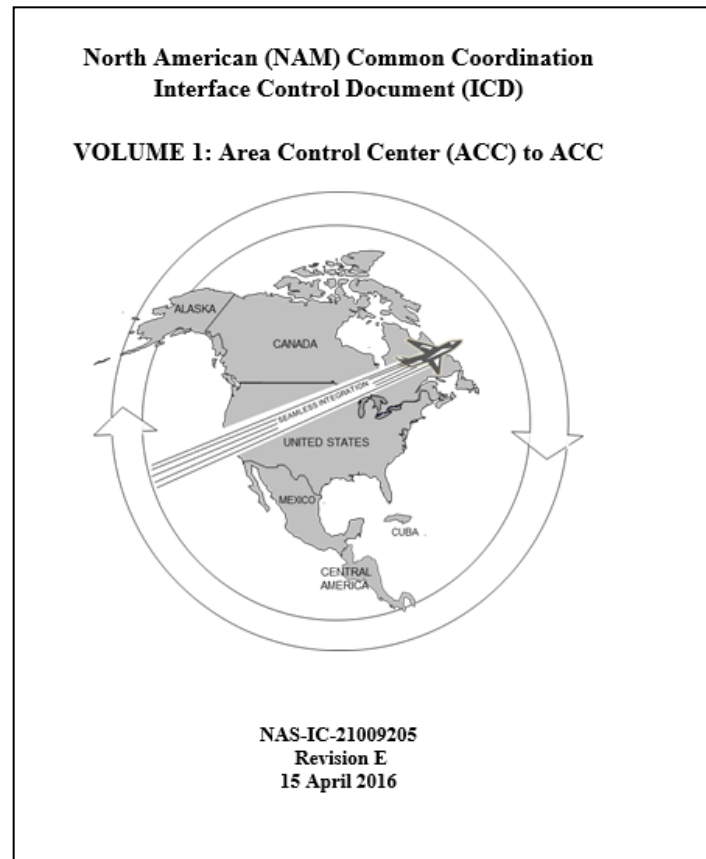
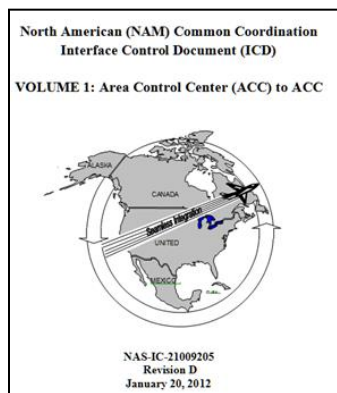
NAM ICD Was last Updated to Version E in 2016

Region Interface Updates →

ICAO 4444 →

ICAO 9694 →

PAN/APAC
AIDC ICD →



NAM ICD Continues Evolve

North American (NAM) Common Coordination Interface Control Document (ICD)

VOLUME 1: Area Control Center (ACC) to ACC

CHANGE HISTORY

Date	Rev.	Action
1 August 2000	--	Initial Draft for C/M/U Review
26 January 2001	--	Draft Sent for ICAO Review
21 March 2002	--	Incorporate NCP 23326 - NAM ICD - Approved Changes (02-03, 02-04, 02-05, 02-07, 02-08, 02-09, 02-10, 02-11, 02-12, 02-13, and 02-14)
12 September 2008	A	Incorporate NCP 32074, ATO0E-NAS-1001 to address technical and editorial changes that have been pre-coordinated with NAV Canada and SENEAM.
05 April 2011	B	Incorporate changes to NAM ICD which include ICAO 2012 Amendment 1 and to address technical and editorial changes pre-coordinated with NAV Canada and SENEAM.
5 December 2011	C	Version update adds Cuba as the fourth NAM ICD interface member.
20 January 2012	D	Version update adds Cuba/Mexico Interface Attachment
15 April 2016	E	Version 'E' update incorporates Point Out messages into Class 3 and upgrades several messages categorized as 'future' to 'current' for optional use within ANSP bilateral agreed on procedural interfaces. Adds COCESNA as an interface member state.



NAM ICD Version 'E' is Current

North American (NAM) Common Coordination Interface Control Document (ICD)

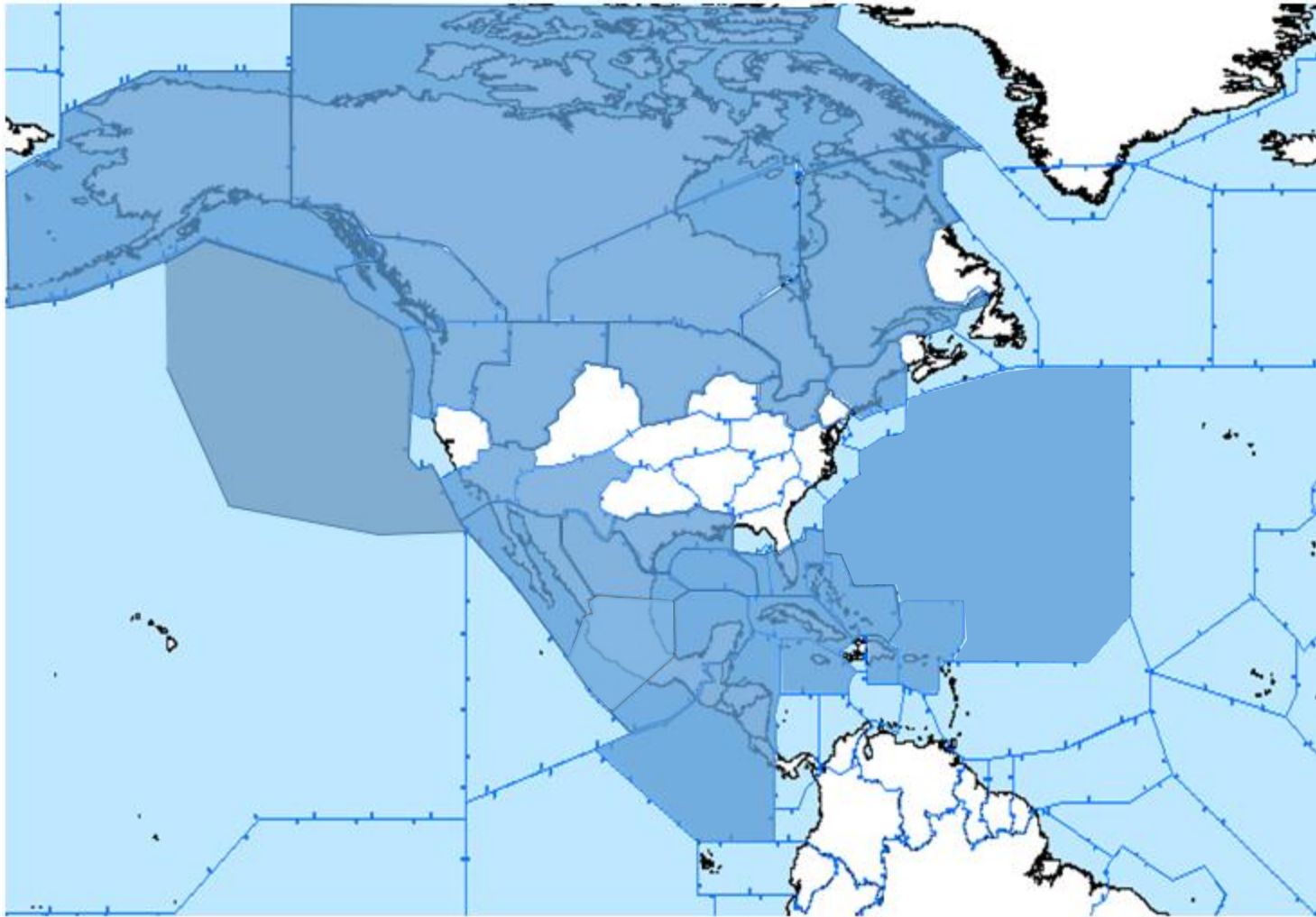
VOLUME 1: Area Control Center (ACC) to ACC



NAS-IC-21009205
Revision E
15 April 2016

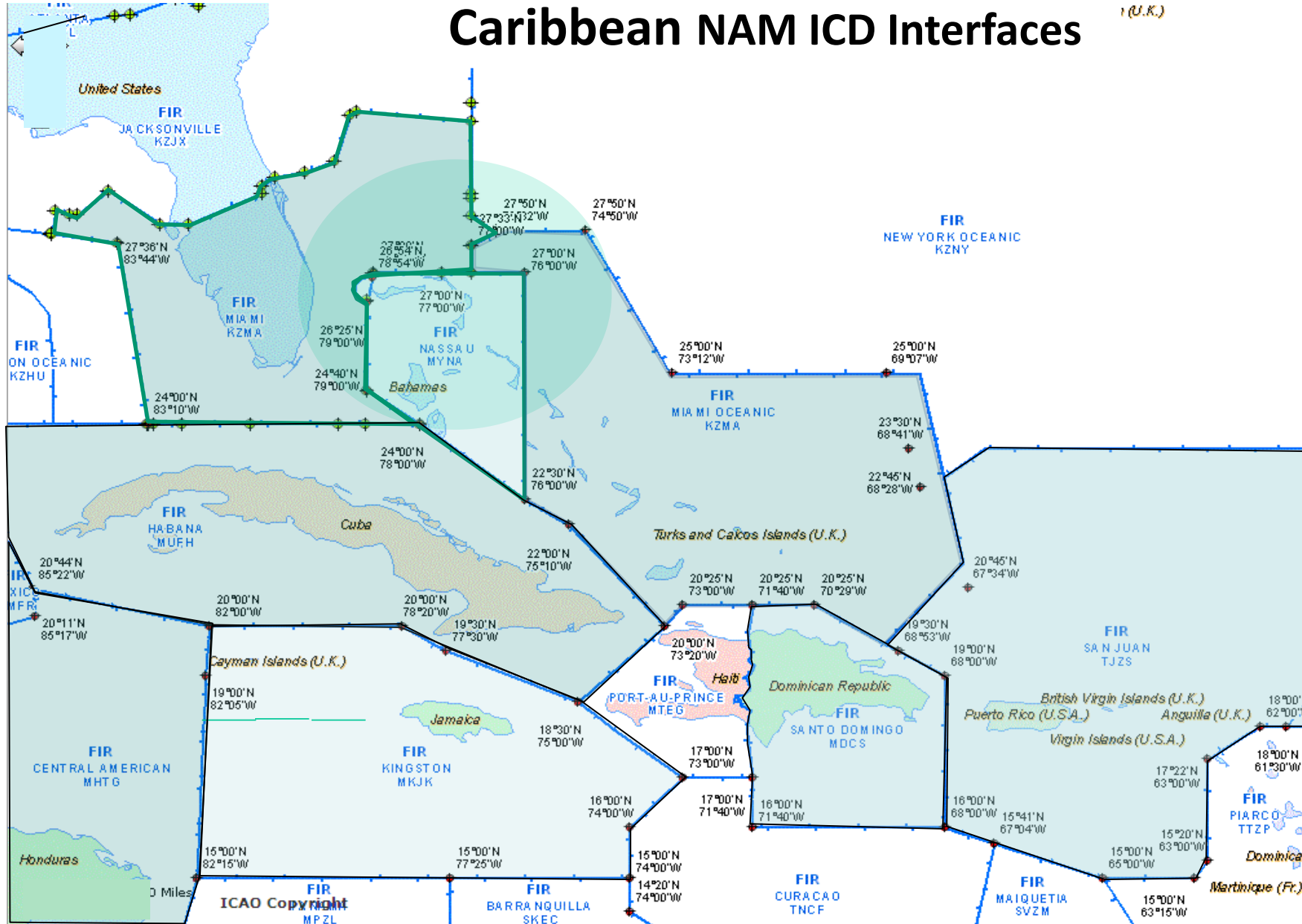


NAM ICD Interfaces Support the ICAO North American, Central American and Caribbean Region



Caribbean NAM ICD Interfaces

(U.K.)



NAM ICD Overview

- **SURVEILLANCE ENVIRONMENT** - The NAM ICD operational environment within North American and Caribbean area is primarily a Surveillance Environment. The existing interfaces are supported by NAM ICD automated data exchange operations between Canada and the US, the US and Mexico, the US and Cuba US and Dominican Republic and Mexico and Cuba.
- While the **surveillance environment is the standard for NAM ICD operations**, it is also recognized that **procedural environments exist** between some Air Traffic Service Units (ATSU).
- Providing ATC units the ability for voiceless **radar handoff and radar point out** as well as message support for **procedural transfer of control** progresses the application's ability to apply standardized automation in both radar/surveillance and procedural environments.
 - This approach is consistent with the goal to reduce the need for verbal coordination per ICAO Doc 4444, Chapter 10, in Section 10.1.

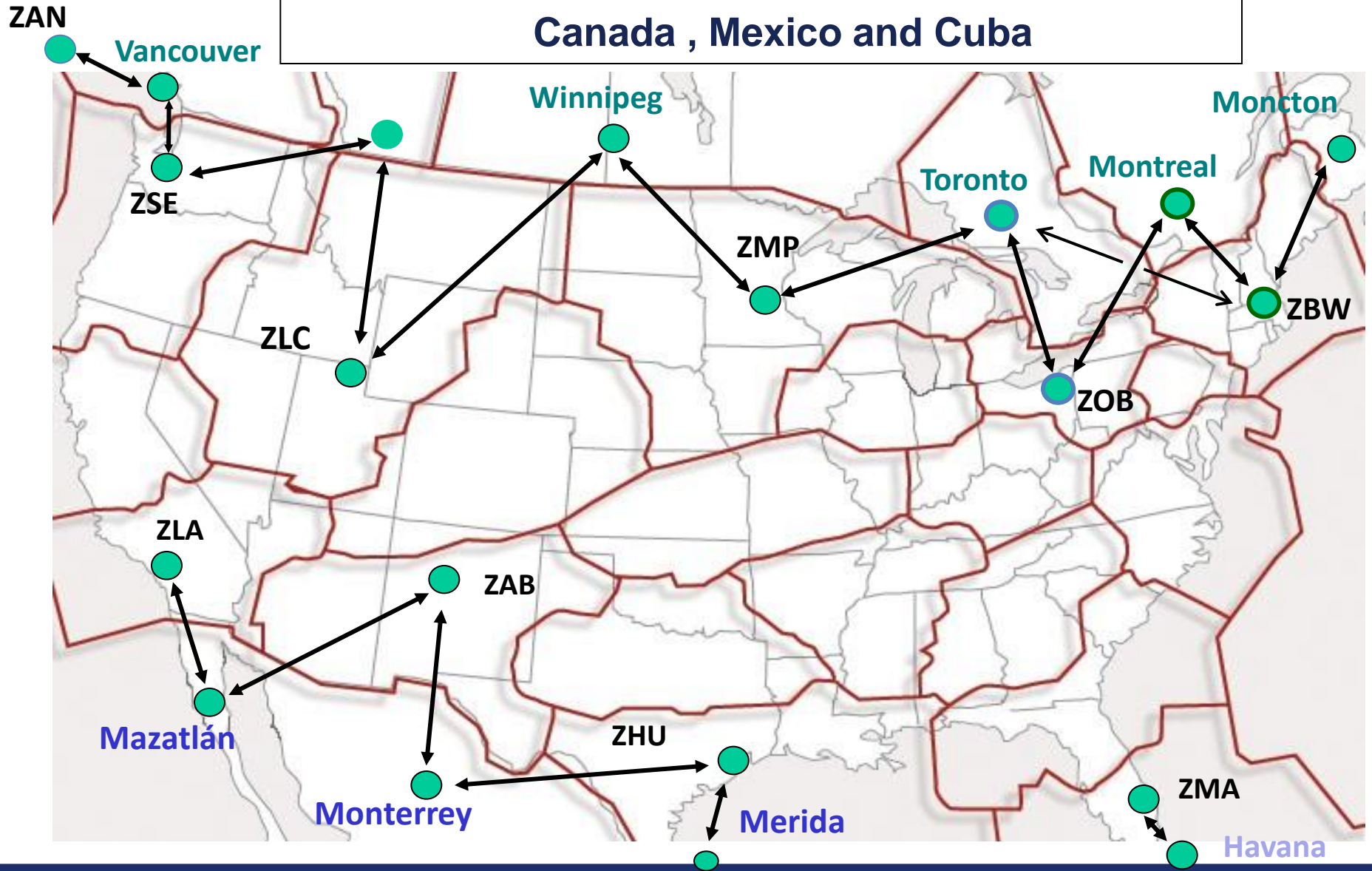


NAM ICD

- NAM ICD Cross Border Automation has been implemented between 6 member states and 24 NACC FIRs in US, Dominican Republic, Mexico, Canada, Cuba and Honduras (COSESNA) providing the opportunity for seamless interfaces between adjacent ATC systems. Operational NAM ICD Interfaces Include:
 - **Dominican Republic – US 1**
 - **Canada – US 14**
 - North America Domestic 11
 - Anchorage 2
 - Oakland Oceanic (ATOP) - Vancouver ACC
 - New York Oceanic (ATOP) – Moncton ACC
 - **Mexico - 7**
 - US -Mexico 5
 - Cuba - 1
 - COCESNA - 1
 - **Cuba – 3**
 - US -Miami
 - Mexico (Merida)
 - COCESNA
 - **COCESNA - 2**
 - Mexico (Merida)
 - Cuba (Havana)

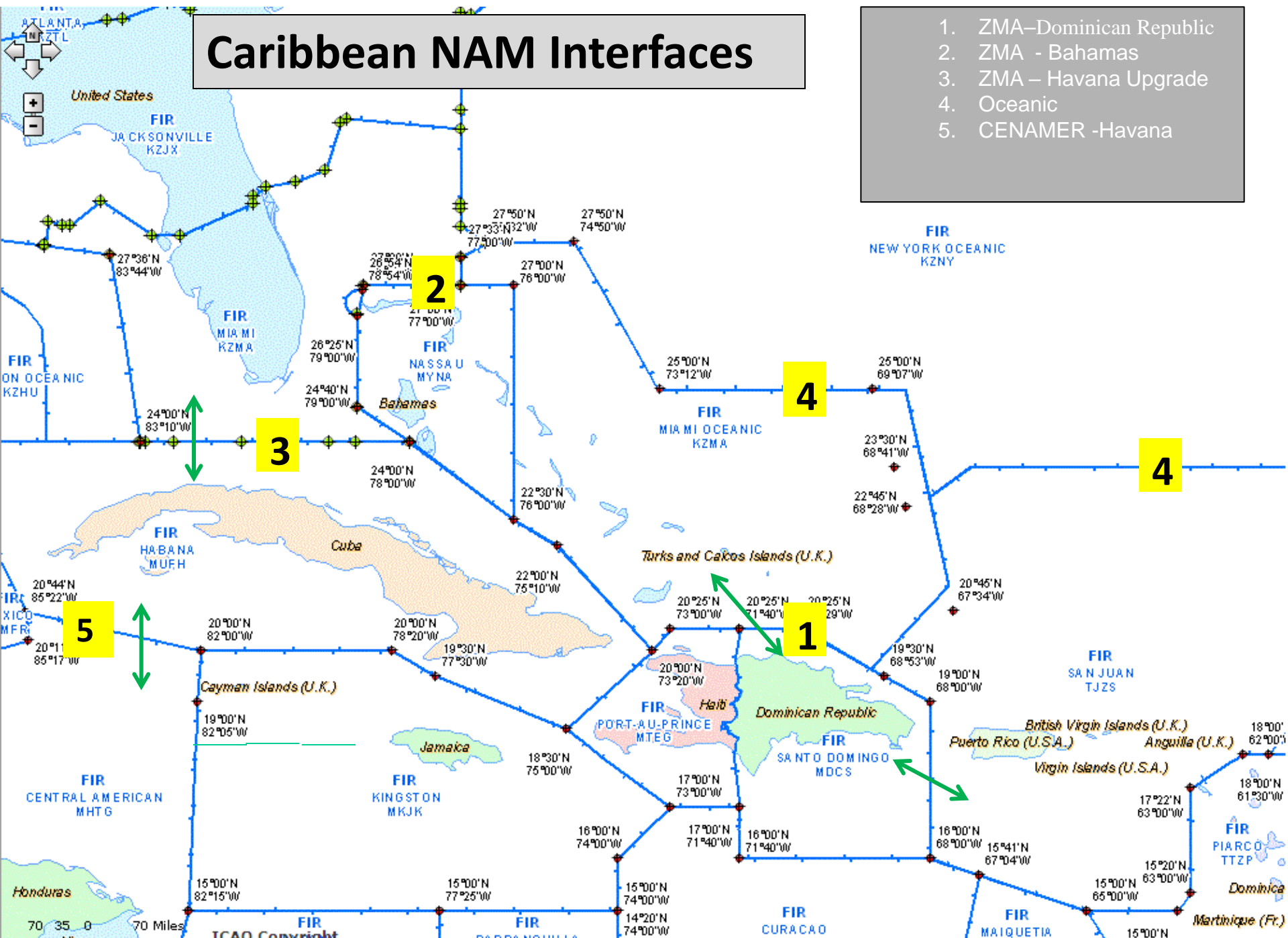


NAM U.S. Automated Interfaces Canada , Mexico and Cuba

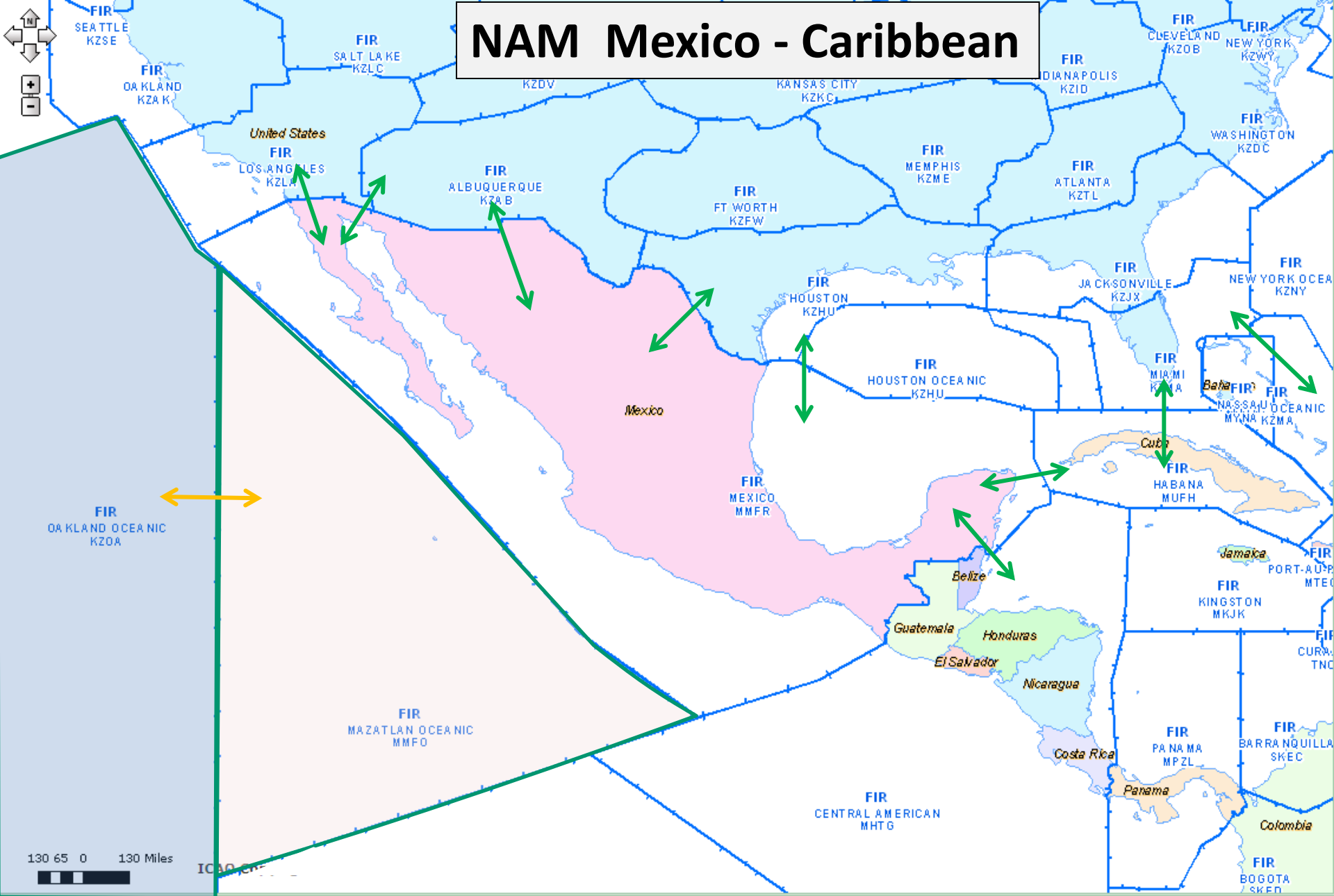


Caribbean NAM Interfaces

1. ZMA–Dominican Republic
2. ZMA - Bahamas
3. ZMA – Havana Upgrade
4. Oceanic
5. CENAMER -Havana



NAM Mexico - Caribbean



North American Environment

- In most NAM environments, radar/surveillance is the operational norm and procedural/non-radar the exception. In many traditional AIDC interfaces procedural/non-radar is more the norm and radar/surveillance 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 handoff and point-out functionality enhancing a positive controlled radar environment.
- Both the NAM and traditional AIDC protocols support the **notification, coordination and the transfer of communications and control phases or functions** to different degrees between ATSU's.
- Full AIDC capability also supports extended equipment capabilities in time and distance based operations where different separation minima are being used in adjacent airspace. The NAM ICD has automated radar handoff messaging definitions within the document as a goal of cross-border interoperability evolution.



ICAO 4444 Coordination Environments

NAM ICD and AIDC

- ATC procedures vary significantly, depending on the surveillance capabilities of the coordinating ATS units in a given boundary environment. For the purpose of ICAO 4444 Appendix 6, the coordination environments are identified as **either surveillance or procedural**.
- In some instances the same type of message may require the inclusion of different or additional data to accommodate the demands of differing environments. Depending on the environment, the timing of the transmission of these messages may also vary. The environment may also affect whether the AIDC message is automatically processed, or displayed to the controller for manual processing.
- A **surveillance environment** is an environment where an ATS surveillance system is in use, and allows controllers to positively identify the traffic. Radar and/or ADS-B are available to the controllers at sector positions on both sides of a common boundary, and traffic is identified by information presented on a situation display. Such facilities permit surveillance coordination procedures to be used.
- A **procedural environment** exists in those areas where surveillance coordination procedures are not available because at least one of the coordinating ATS units does not have a surveillance capability, or the surveillance capabilities differ. For example, surveillance in oceanic and remote areas is often achieved with ADS-C, CPDLC or voice position reports; in such areas, coordination procedures differ from those used in a surveillance environment.



AIDC – NAM – OLDI Message Sets

AIDC	NAM	OLDI
ABI	FPL	ABI
CPL	CPL	ACT
EST	EST	REV
MAC	CNL	PAC
PAC	MOD	MAC
CDN	MIS	SDM
REJ	IRQ	ATC
TRU	IRS	RAP
TOC	TRQ	RRV
AOC	ASM	CDN
EMG	RTI	SBY
ACP	RTU	ACP
LAM	RLA	TIM
LRM	RTA	LAM
ASM	LAM	LRM
FAN	LRM	COF
FCN	CHG	ROF
ADS	ABI	MAS
TDM	AOC	HOP
	TOC	
	POI	
	POA	
	POJ	



NAM ICD Version 'E' Interface Control Document (ICD) Revision E

- The NAM ICD Version 'E' document change addresses messages exchanged between Air Navigation Service Providers (ANSP) or Area Control Centers (ACCs) for IFR aircraft. Within the NAM ICD, ATC operations units forward from unit to unit, as the flight progresses, necessary flight plan and control information. NAM ICD usage supports the Notification, Coordination, Transfer of Control phases outlined within the ICAO Doc. 4444, Pan Regional Interface Control Document (PAN ICD) for ATS Interfacility Data Communications and (AIDC) ICAO Doc 9694-AN/955 Manual of Air Traffic Services Data Link Applications.
- The proposed NAM ICD Version 'F' is projected to include additional boundary agreements with Handoff notes and functionality development information to be included in the U.S. – Canada boundary agreement.



NAM ICD Version 'E' Overview (Continued)

- In continuing support for the **radar/surveillance efficiency and migration toward non-verbal ATSU to ATSU automation** within current and future interfaces, NAM ICD-E update will support radar handoff messages. **Radar Handoff** messaging has been defined in the NAM ICD since its inception as well as the direct communication interface requirement to support the capability
 - Automated radar Handoff will be supported by implementing existing **Interface Management Messages** with the addition of a 'system heartbeat message', also used in AIDC.
- Additionally, NAM ICD-E will incorporate radar **Point Out messages into Class 3**. By enhancing Class 3 to include point out messages the operational boundaries between ATSUs are better served by incorporating more options for surveillance supported coordination capabilities within the context of the NAM ICD.
- In keeping with the NAM ICD philosophy to provide incremental 'stepping stone' functionality options, the NAM ICD-E lays the foundation for both **Basic and Enhanced Point Out**. The US and Canada have agreed to implement **Point Out - Basic** messaging capability to provide the automated flight data to accompany verbal cross border point outs. Point Out automation procedures must be defined in bilateral ATS agreements which describe data information and/or any supplemental automation text to be used with verbal point outs.



NAM ICD Version 'E'

3. NAM Core Message Set

The NAM core message set is summarized in the table below.

Table 2. NAM Core Message Set

Category	Msg.	Message Name	Description	Priority	Source
Coordination of pre-departure (near-border) flights	FPL	Filed Flight Plan	Flight plan as stored by the sending ATS unit at the time of transmission. Used only for proposed flights.	FF	ICAO Doc. 4444
	CHG	Change	Changes previously sent flight data (before estimate data has been sent).	FF	
	EST	Estimate	Identifies expected flight position, time and altitude at boundary.	FF	
Coordination of active flights	CPL	Current Flight Plan	Flight plan as stored by the sending ATS unit at the time of transmission, including boundary estimate data. Used only for active flights.	FF	ICAO Doc. 4444
	CNL	Cancellation	Cancels an FPL or a CPL.	FF	
	MOD	Modify	Changes previously sent flight data (after estimate data has been sent).	FF	New message, format per CHG.
	ABI	Advance Boundary Information	Message transmitted to provide information on a flight to the receiving ATSU	FF	PAN ICD
General Information	MIS	Miscellaneous	Free-format text message with addressing options.	FF	NAT ICD/PAN ICD
Interface Management	IRQ	Initialization Request	Initiates activation of the interface.	FF	Based on existing CAATS protocols.
	IRS	Initialization Response	Response to an IRQ.	FF	
	TRQ	Termination Request	Initiates termination of the interface.	FF	
	TRS	Termination Response	Response to a TRQ.	FF	
	ASM	Application Status Monitor	Message to confirm adjacent center's ATC system is online	FF	
Radar Handoff	RTI	Radar Transfer Initiate	Initiates a radar handoff.	FF	New messages based on existing FAA protocols and ICAO Doc. 4444 format
	RTU	Radar Track Update	Provides periodic position updates for a track in handoff status.	FF	
	RLA	Radar Logical Acknowledgment	Computer acceptance of an RTI message.	FF	
	RTA	Radar Transfer Accept	Accepts or retracts a handoff.	FF	
Point Out	POI	Point Out Initiate	Initiates a Point Out	FF	
	POA	Point Out Accept	Computer acceptance of a POI	FF	
	POJ	Point Out Reject	Computer rejection of a POI	FF	
Transfer	TOC	Transfer of Control	Initiates procedural transfer of control	FF	PAN ICD
	AOC	Acceptance of Control	Indicates procedural acceptance of control	FF	
Acknowledgements (included in each of the above services)	LAM	Logical Acknowledgment	Computer acceptance of a message.	FF	ICAO Doc. 4444
	LRM	Logical Rejection	Computer rejection of an invalid message.	FF	NAT ICD/PAN ICD



AUTOMATED HANDOFFS



ERAM CAATS Timeline

International Common Coordination Software Timeline

2016 2017 2018 2019 2020 2021

FAA ERAM

ERAM Final Investment Decision



ERAM Systems Engineering



ERAM Hardware Engineering



ERAM Software Engineering



ERAM Integration & Test



ERAM Implementation



NAV Canada CAATS

CAATS Requirements/Engineering



CAATS Software Development/Test



CAATS Implementation



FAA NAV Canada Joint implementation

Joint ERAM/CAATS Implementation



Support for Automated Handoffs

- Class III Handoff
 - Partnering with Canada for CAATS – ERAM handoffs
 - Includes NAS-like cross-border handoffs
- Class III handoff utilizes messaging capabilities of Class I & II developed in Host and ported to ERAM
- Handoff messages will mirror NAS messages and include:
 - Radar Transfer Initiate (RTI)
 - Radar Logical Acknowledgement (RLA)
 - Radar Track Update (RTU)
 - Radar Transfer Accept (RTA)
- Future implementation of Point Out functionality will fall under Class III
- Handoff capabilities require integrating technical & operational aspects of automated aircraft transfer with support of RDP processing



NAM ICD Version 'E' Enhancements

- **Notification, Coordination and Transfer of control**
- The capability to revert to verbal coordination and manual (or implicit) transfer of control shall be retained.
- **Notification** – FPL, **ABI**
- **Coordination** – CPL LAM , enhanced: MOD, EST , FPL, LRM
POI,POA,POJ
- **Transfer of Control** – Manual Handoff/Automated Handoff
 - Automated Handoff
 - Radar Transfer Initiate (RTI)
 - Radar Logical Acknowledgement (RLA)
 - Radar Track Update (RTU)
 - Radar Transfer Accept (RTA)
 - **Automated Transfer**
 - **Transfer of Control (TOC)**
 - **Acceptance of Control (AOC)**



NAM ICD Version 'E' Changes

- **Changes, activations and corrections which will make up the NAM ICD-E activities included:**
- Radar Handoff messaging and Interface Management Support
 - US – Canada to Initiate Radar Handoff/Point Out messaging development to support existing domestic interfaces
 - US – Canada Boundary Agreement will reflect Handoff implementation specifics
 - Implementing Interface Management Messages, ASM message added
 - Identification/support of Direct Communication requirement for Handoff/Point Out
- Radar Point Out messages added as Class 3 capability
 - Point Out – Basic Added/Identified for Implementation
 - Point Out – Enhanced , Added for Future Implementation
- Supplemental Messages ABI, TOC/AOC messages defined
- Appendix 'A' Error Codes Expanded
- Corrections identified and corrected



NAM ICD

Detailed

- While the surveillance environment is the standard for NAM ICD operations, it is also recognized that procedural environments exist between some Air Traffic Service Units (ATSU). The application of ATC units to apply standardized automation in both radar/surveillance and procedural environments is consistent with the goal to reduce the need for verbal coordination per ICAO Doc 4444, Chapter 10, in Section 10.1.
- In continuing support for the radar/surveillance efficiency and migration toward non-verbal ATSU to ATSU automation within current and future interfaces, NAM ICD-E update will support system development of radar handoff messages. Radar Handoff messaging has been defined in the NAM ICD since its inception as well as the direct communication interface requirement to support the capability.
- Automated radar Handoff will be supported by implementing existing Interface Management Messages with the addition of a ‘system heartbeat message’, also used in AIDC.
- Several NAM ICD messages previously categorized as ‘future’ will be upgraded to ‘current’ for optional development. The ABI, TOC and AOC messages borrowed from AIDC message set will be categorized as ‘supplemental’ and may be used to support procedural interfaces between the US and Canada.
- Additional codes to better identify errors in cross border automated data exchange have been proposed for the Appendix ‘A’ Error Message Table amendment when LRMs are used.



Extending the NAM Automation Standard

- Compatibility management between existing/emerging international automation systems essential to optimize capabilities & meet user needs
- U.S. centralized geographic position requires taking the lead to assure compatibility is maintained
- FAA also participates in Caribbean & South American (CARSAM) ATC automation ICD development
- Near term countries with interface/ enhance interface initiatives pending
 - US - Dominican Republic
 - US - Bahamas
 - US – Cuba
 - COCESNA – Mexico (Merida)
 - COCESNA - Cuba



Cross Border Telecommunications and AFTN

- Current communications infrastructure which sends NAM flight plan information to Canada, Mexico and Cuba resides on NADIN, AFTN and MEVA
- Current network adequately supports Class I and II messaging
- Communication requirements will increase drastically with Class III and the need to support the automated handoff capability
 - AFTN is a 'store and forward' network which is inadequate for the robust air traffic messaging needed with Class II and III; it has been used because of its availability
 - Handoff capability requires a real time communications link to support the initiation, track update and acceptance of handoffs



Implementation Strategy

- Implementing AIDC with any interface requires stable protocol (IP) and AMHS service
 - Direct IP service through NADIN MSN Replacement required
 - AMHS/FTI/NADIN is scheduled to extend the IP support for the other ERAM – CAATS interfaces to NAV CANADA and SENEAM interfaces within the near term; waterfall currently being worked
 - MEVA III/IV is being looked at to support enhanced capabilities between the US and NACC partners for future interface support



Cross Border Communication

- Upgrade current AFTN to Internet Protocol (IP) and AMHS service
 - Direct IP service through NADIN MSN Replacement required
 - AMHS/FTI/NADIN is scheduled to extend the IP support for the other ERAM – CAATS interfaces to NAV CANADA and SENEAM interfaces within the near term; waterfall currently being worked
 - MEVA II/III is being looked at to support enhanced capabilities between the US and NACC partners for future interface support



CONCLUSION

- Substantial progress has been made between the US and NACC neighbor countries but more can be done to increase automation compatibility and efficiency . NAM ICD extends the region's surveillance interface capabilities and increases procedural support
- Candidates for next steps include but are not limited to the following:
 - New Interfaces between adjacent ANSPs
 - Improving Interfaces between adjacent ANSPs
 - More advanced message sets (e.g. flight data amendment capability)
 - More support for direct routes across boundaries
 - Involvement of ATC system vendors to increase compatibility
 - Integration of compatible NACC automation
 - Handoff/Point Out
- This automation activity has a direct benefit on our collective ability to provide more efficient and seamless service to our users.

