International Civil Aviation Organization
North American, Central American and Caribbean Office

WORKING PAPER

AIDC/TF/2 — WP/05
19/02/15

**Second NAM/CAR Air Navigation Implementation Working Group (ANI/WG) Air Traffic Services Inter-facility Data Communication (AIDC) Task Force (AIDC/TF/2) Meeting**
Mexico City, Mexico, 27 February 2015

**Agenda Item 3 Implementation issues discussion**
**3.3 NAM ICD changes introduced by version E**

# NORTH AMERICAN (NAM) COMMON COORDINATION INTERFACE CONTROL DOCUMENT (ICD) VERSION 'E' UPDATE

(Presented by United States)

**EXECUTIVE SUMMARY**

Within the North American Aviation Trilateral (NAAT/5), Canada, Mexico, and the U.S. agreed to cooperate on development of a seamless interface between automation systems, focusing on automated exchange of ICAO flight data. The radar/surveillance operations environment supported by the NAM ICD protocol has evolved to include 20 separate cross border domestic interfaces with three domestic – oceanic interfaces projected for 2015. The NAM ICD Version 'E' update provides guidance for integrating enhanced radar/surveillance automation efficiencies and migration toward non-verbal ATSU to ATSU automation within current and future interfaces.

| | |
|---|---|
| **Action:** | Review the content of the NAM ICD Version 'E' when provided. Consult with the region for subject matter expertise in implementing existing or emerging functionality for automated data exchange using the NAM ICD. |
| *Strategic Objectives:* | • Safety<br>• Air Navigation Capacity and Efficiency<br>• Environmental Protection |
| *References:* | • Air Traffic Service (ATS) Interfacility Data Communications (AIDC), North American Common Coordination Interface Control Document (NAM ICD)<br>• Pan Regional Interface Control Document (PAN ICD) for ATS Interfacility Data Communications (AIDC)<br>• ICAO Doc 4444 — *ATM — Air Traffic Management.* |

## 1. Introduction

1.1 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.

1.2 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. Document changes include:

- 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.
- 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 termed as 'supplemental' and may be used to support procedural interfaces between the US and Canada, or between other countries desiring to implement the hybrid message functionality between interfaced NAM ICD member states.
- Additional codes to better identify errors in cross border automated data exchange have been proposed for the **Appendix** "Error Message Table" amendment when LRMs are used.

## 2. Discussion

2.1 The accompanying briefing provides the NAM ICD Version 'E' update

## 3. Action by the Meeting

3.1 The NACC AIDC Task Force is invited to:

a) note the content of this paper;

b) review the NAM ICD when provided; and

c) work in a collaborative manner with NACC member states to take advantage of the existing subject matter expertise they have used to implement the capabilities described in the NAM ICD in implementing their NAM ICD interfaces.

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APPENDIX

# North American (NAM) Common Coordination Interface Control Document (ICD) Version ‘E’ Update

Federal Aviation Administration

**Presented To: NACC**

**By: Dan Eaves, FAA En Route Requirements & Validation**

**Date: Feb 2015**

# 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 and Cuba offered opportunity for utilizing enhanced interfaces to FAA's En Route Automation Systems

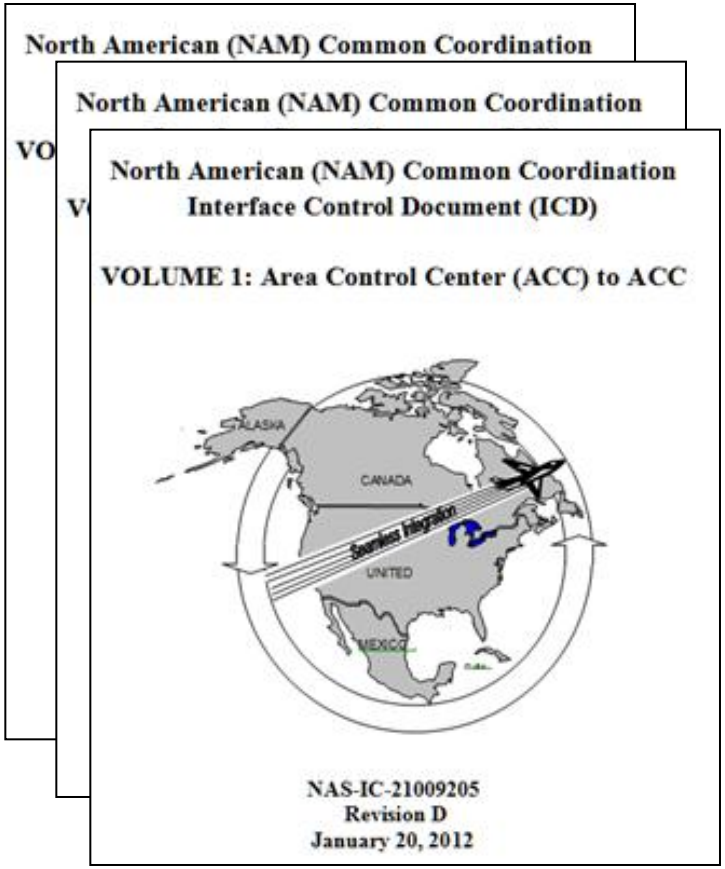
# Cross Border Automation - Operational Benefits

- 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

# NAM ICD Evolved from 4444, AIDC ICDs

ICAO 4444 →

NAT & PAC AIDC ICDs →



# NAM ICD Continues to Evolve with Version 'E'

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

**VOLUME 1: Area Control Center (ACC) to ACC**

## CHANGE HISTORY

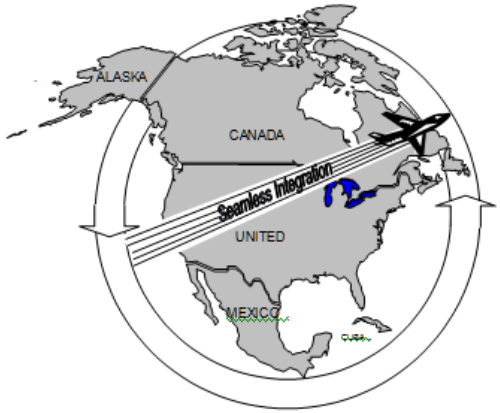
| Date | Rev. | Action |
|---|---|---|
| 1 August 2000 | -- | Initial Draft for C/M/U Review |
| 26 January 2001 | -- | Draft Sent for ICAO Review |
| 21 March 2002 | -- | Incorporate NCP 23326 - NAM ICD - Approved Changes (02-03, 02-04, 02-05, 02-07, 02-08, 02-09, 02-10, 02-11, 02-12, 02-13, and 02-14) |
| 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 |
| 28 February 2015 | E | Version 'E' update incorporates Point Out messages into Class 3 and upgrades several messages categorized as 'future' to 'current' for optional use within US – Canada procedural interfaces. |

# NAM ICD Version ‘E’

DRAFT

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

**VOLUME 1: Area Control Center (ACC) to ACC**




**NAS-IC-21009205**
**Revision E**
**28 February 2015**

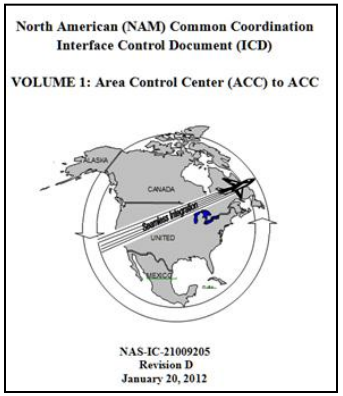
**Canada/Mexico/Cuba/United States Automation Systems Interface Taskforce (C/M/U ASI/TF)**

# NAM ICD Version E Has Been Drafted & Is Under Review

ICAO 4444

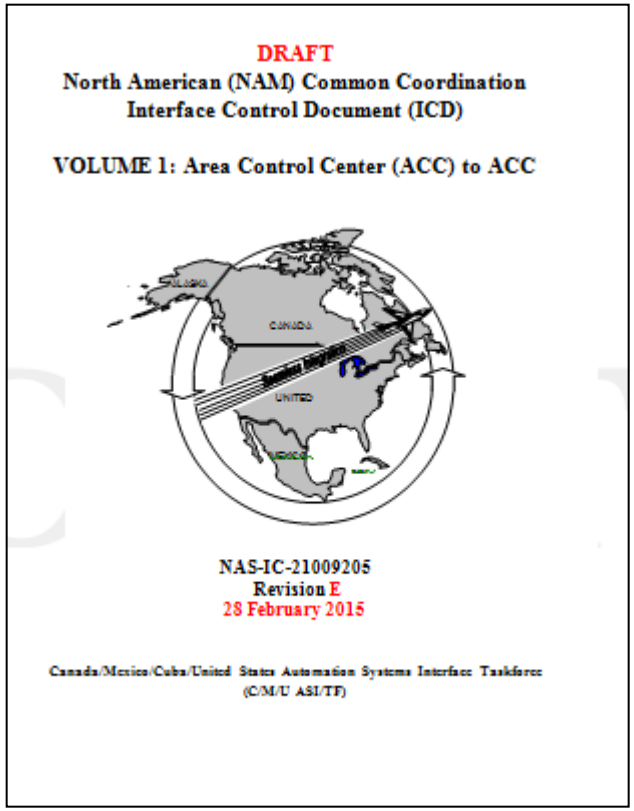
ICAO 9694

PAN
AIDC ICD


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

VOLUME 1: Area Control Center (ACC) to ACC

NAS-IC-21009205
Revision D
January 20, 2012


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

VOLUME 1: Area Control Center (ACC) to ACC

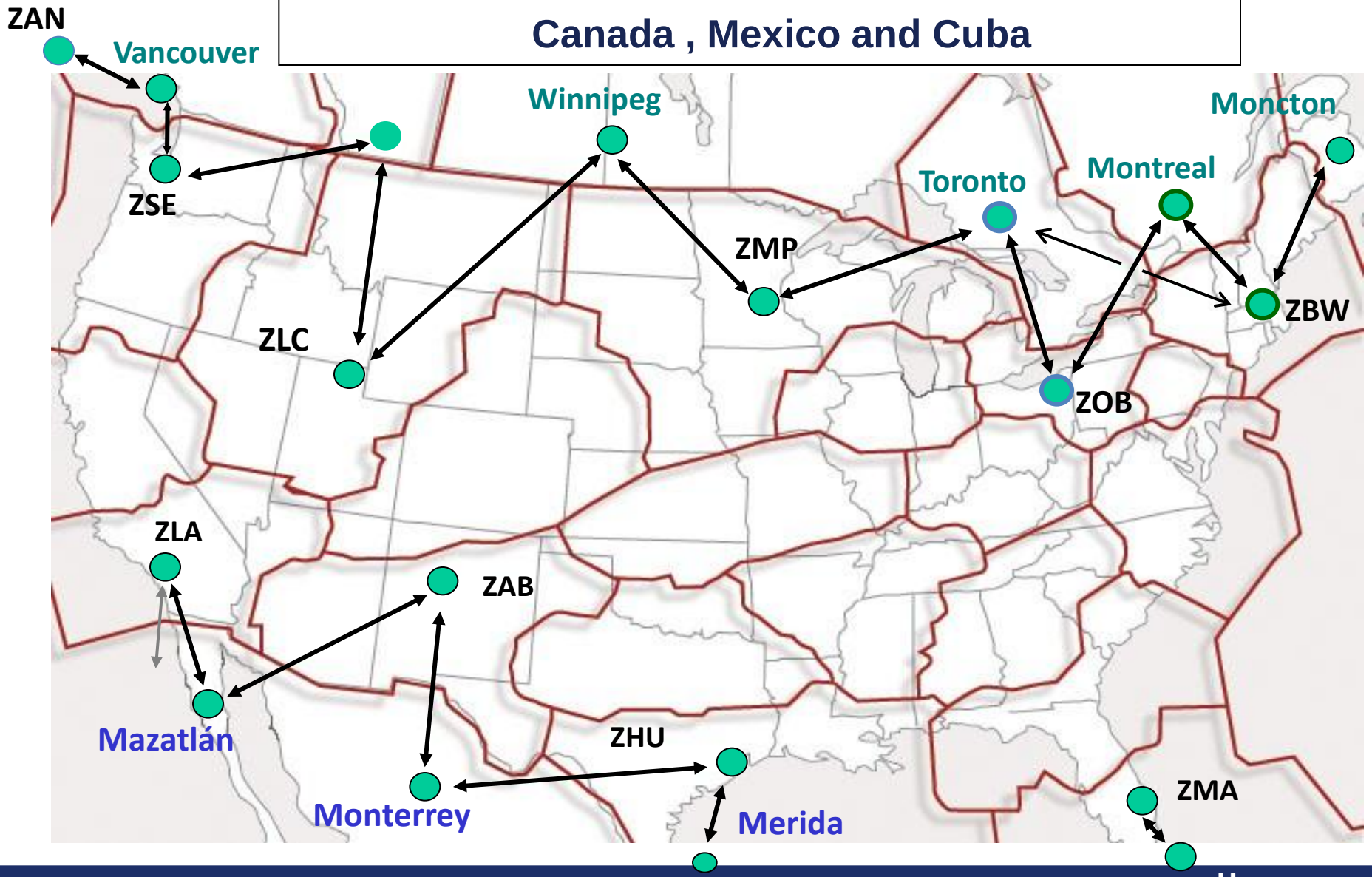
NAS-IC-21009205
Revision E
28 February 2015

Canada/Mexico/Cuba/United States Automation Systems Interface Taskforce
(C/M/U ASI/TF)

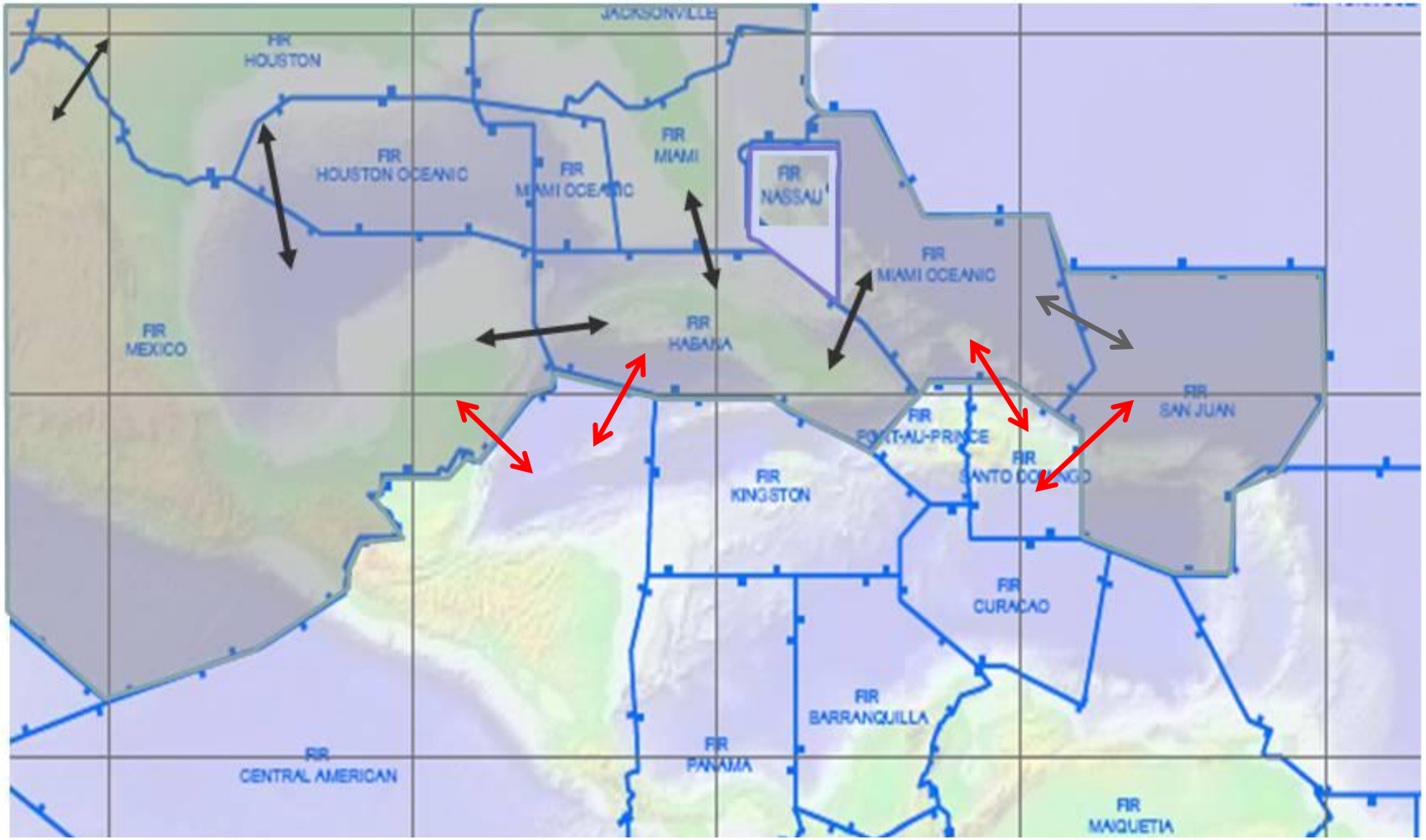
# NAM ICD and Automation Task Force

- 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
- NAM ICD defines message formats for implementation of interfaces between automation systems:
  - U.S. & Canada 2009
  - U.S. & Mexico 2008
  - Cuba  added in Dec 2011
- Same standard used as guide for Caribbean flight data automation compatibility
- International neighbors installing new systems and look to maximize benefits of their automation investment

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



# NACC New NAM ICD Interfaces
# Work in Progress



# 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 ATSUs.
- 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.

## North American (NAM) Common Coordination Interface Control Document (ICD) Revision E 28 February 2015

- 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 NAM ICD Version ‘E’ (NAM ICD-E) update does not change the automated data exchange conventions for any existing operational interface. Existing NAM ICD member states do not have to implement any changes in support of NAM ICD-E.**

## NAM ICD Version ‘E’
## Overview

- **SURVEILANCE 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 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 Version 'E'Handoff and Point Out 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 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.

- 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 Comparison

## 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 Acknowledgement | 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 Acknowledgement | Computer acceptance of a message. | FF | ICAO Doc. 4444 |
| | LRM | Logical Rejection | Computer rejection of an invalid message. | FF | NAT ICD/PAN ICD |



## Version D

### 3. NAM Core Message Set

The NAM core message set is summarized in Table 2 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. |
| General Information | MIS | Miscellaneous | Free-format text message with addressing options. | FF | NAT 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 | |
| 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 Acknowledgement | Computer acceptance of an RTI message. | FF | |
| | RTA | Radar Transfer Accept | Accepts or retracts a handoff. | FF | |
| Acknowledgements (included in each of the above services) | LAM | Logical Acknowledgement | Computer acceptance of a message. | FF | ICAO Doc. 4444 |
| | LRM | Logical Rejection | Computer rejection of an invalid message. | FF | NAT ICD |

# 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)
- 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 include:**
- 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 Version 'E'
# 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.
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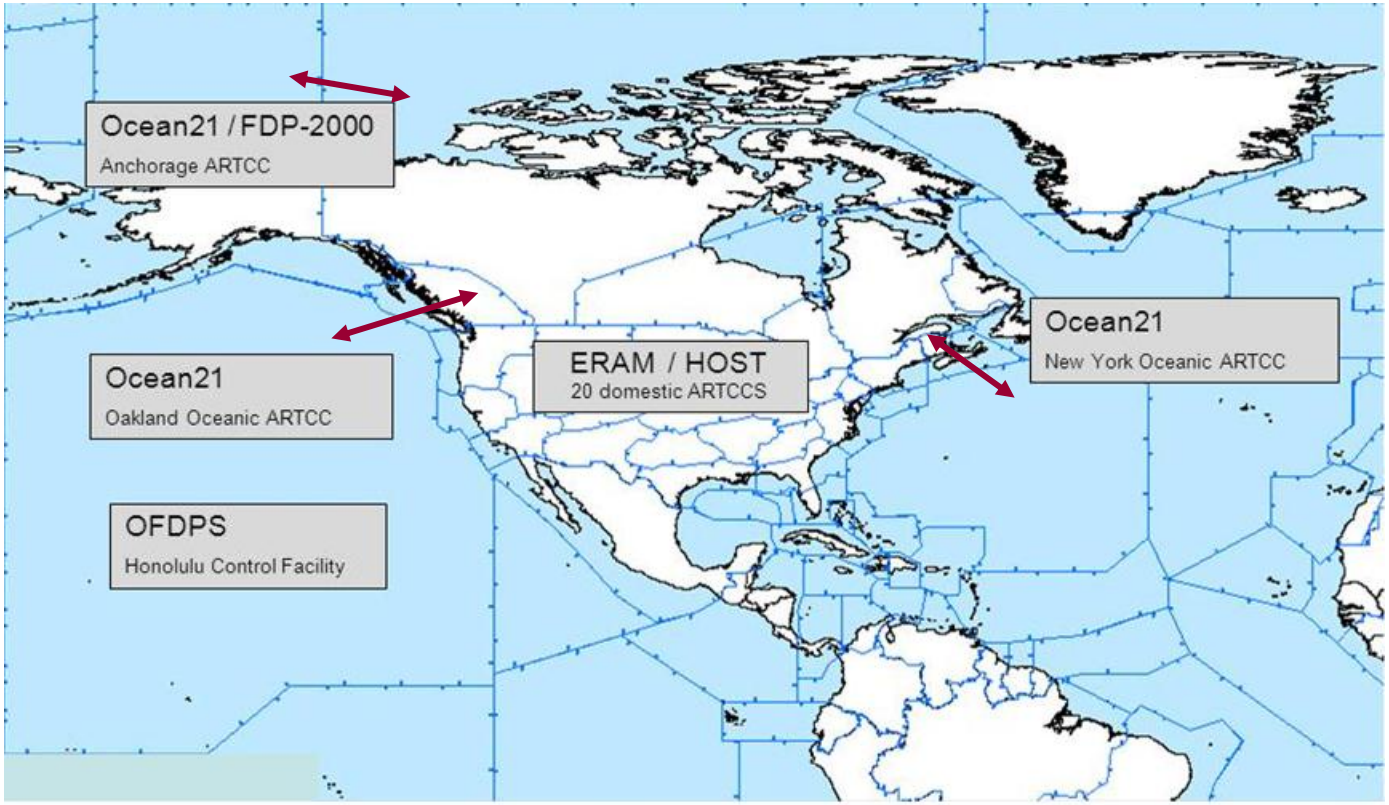
- Several NAM ICD messages previously categorized as 'future' will be upgraded to 'current' for optional development. The ABI, TOC and AOC messages borrowed from AIDC message set will be categorized as 'supplemental' and may be used to support procedural interfaces between the US and Canada.
- Additional 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.

# NAM ICD Interfaces

**US Oceanic ATC System ATOP has added NAM functionality with planned interfaces between Oakland Oceanic, Anchorage Oceanic and New York Oceanic with Canada's CAATS**



# Extending the US 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

# 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 Version ‘E’ 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.