

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

United States Automated Data  
Exchange Interface and Cross Border  
Handoff – 2020

Presented To: NACC AIDC Task Force

By: Dan Eaves, FAA

Date: February 25-28, 2020

*Agenda Item 3: NAM/CAR Pending AIDC  
Implementation Process*



Federal Aviation  
Administration



# Automation Harmonization

- Support for bilateral solutions & user collaboration needed to ensure automation compatibility as interface systems evolve
- Solutions must provide extensible compatibility with our North American & international neighbors
- Goal is to extend operational efficiencies through contiguous computer-to-computer coordination across country and system boundaries



# Automation Benefits

- Our customers' safety and efficiency interests extend beyond the borders of our airspace system. Operational efficiencies gained in our airspace extends automation borders as aircraft travel into other regions and transit service providers. Provides direct benefit to border ARTCCs, indirect to all ARTCCs
- Traditional benefits from automation include:
  - Reduced workload for controllers;
  - Reduction of readback/hearback errors during coordination;
  - Reduced “controller to controller” coordination errors; and language barrier issues
  - Enabler for performance based navigation initiatives and emerging technologies with automation
  - Voiceless coordination



# Extending US automation beyond our borders with interfaces - NAM Cross Border Interfaces

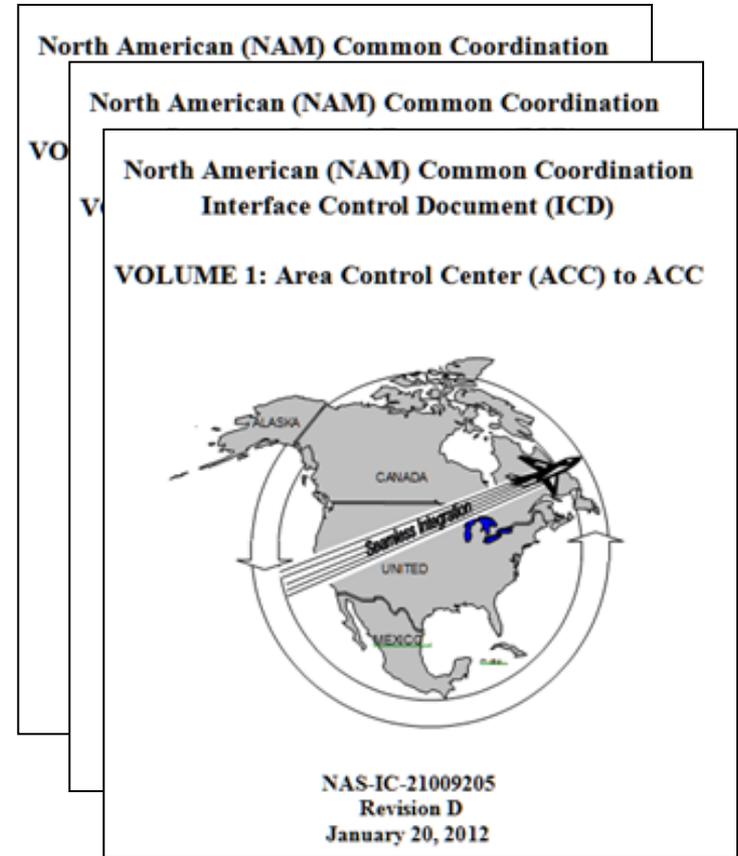
- Within North American Aviation Trilateral (NAAT/5) Canada, Mexico & U.S. agreed to cooperate on development of **seamless** interface between countries and automation systems. North American Common Coordination Interface Control Document (NAM ICD) was adopted as guidance document
- NAM ICD defines message formats for implementation of interfaces between automation systems:
  - U.S. & Canada, 6 Area Control Centers, 5 ARTCCs
  - U.S. & Mexico, 3 Area Control Centers, 3 ARTCCs
  - U.S. & Cuba Miami ARTCC to Havana Area Control Centre
  - U.S. & Dominican Republic, Miami ARTCC to Santo Domingo Area Control Centere



# NAM ICD Evolved from ICAO 4444, AIDC ICDs

ICAO 4444 →

PAN ICD (NAT & APAC)  
AIDC ICDs →



# NAM ICD Current Version 'E'

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

### Area Control Center (ACC) to ACC



NAS-IC-21009205  
Revision E  
15 April 2016

North American, Central American and Caribbean Automation Systems Interface

# NAM ICD Version F - 2020

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

### Area Control Center (ACC) to ACC



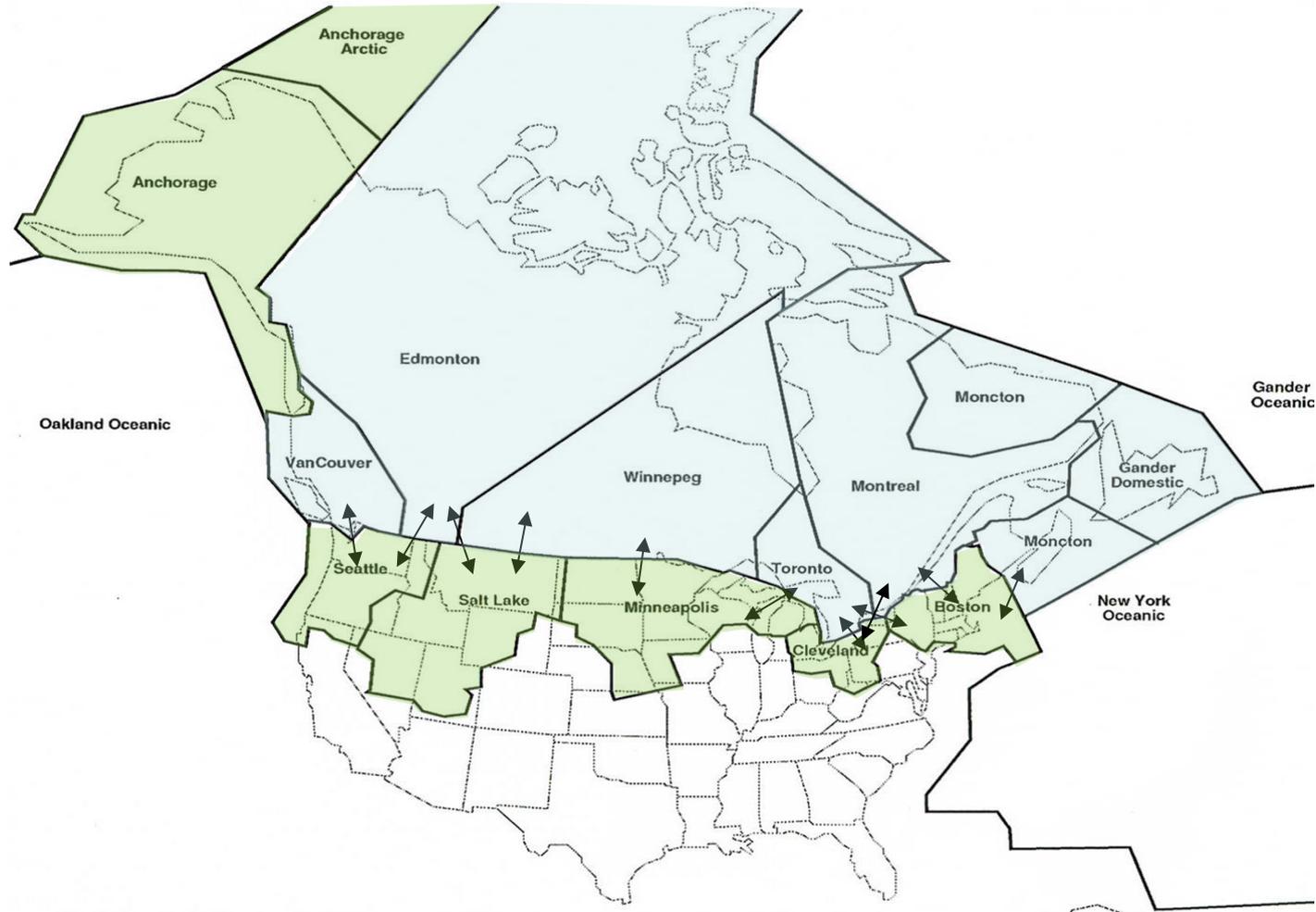
NAS-IC-21009205  
Revision F  
2020

North American, Central American and Caribbean Automation Systems Interface

# NAM ICD Message Classes Overview

- Class 1 Capabilities
  - Active flight plans for IFR Flights (via CPL)
  - Proposed flight plans for IFR flights (via FPL) – where agreed between ANSPs
  - Logic Accept Message (LAM)
- Class 2 Capabilities
  - Filed flight plans for IFR flights (via FPL and EST)
  - Modifications to CPL/FPLs that were activated by an EST (via MOD)
  - Modification of an FPL (via CHG)
  - Cancellation of CPL/FPLs (via CNL)
  - Logical Reject Message (LRM)
- Class 3 Capabilities – Handoff
  - Radar Handoff (via RTI, RTU, RTA, RLA)
  - Interface Management Messages - IRQ, IRS ,TRQ ,TRS, ASM
  - Point Outs (via POI, POA, POJ)

# Cross Border Handoffs Project Initially includes Canada and the US between CAATS and ERAM



# 2020 Automation Infrastructure ERAM Enhancements 2

## Cross Border Handoffs Initiative

- Automated ‘voiceless’ transfer of control between U.S. and Canada helps shift the controller’s workload from manually intensive coordination tasks and focus on job-related tasks
- Performance Enabler
  - 24 X 7 Handoff capability provides controller benefits to existing automated data exchange between countries
  - Evolves Class II Interface to Class III
- Preserves the five miles cross border separation standard currently used between U.S. and Canada at 11 individual ARTCC-ACC interfaces

# Automation Infrastructure ERAM Enhancements 2

## Cross Border Handoffs

- Automated ‘voiceless’ transfer of control between US and Canada is scheduled in two phases
  - SIG 1814 consisting of infrastructure communications enhancements and ERAM-CAATS system to system messaging is scheduled for deployment in 2020-21
  - SIG 1815 consisting of new handoff messages and the legacy NAM ICD messages which will travel on the communications infrastructure enhancements between ERAM-CAATS is scheduled for deployment in 2021-22

# Handoff Developmental Interest Items

- NAM Telecommunication - Direct Connectivity Required
  - Due to real time handoff messaging per NAM ICD
- ICD Messages should be software selectable to maintain flexibility with adjacent ANSPs
- First Order Dependency of Interface Messages
  - CPL Success Required/ FPL-EST Success Required then Handoff Sequence RTI – RLA – RTU - RTA

# Any interface exchanging radar/surveillance position data, including radar handoffs, shall not use AFTN

## 1. Introduction

The communications protocols and physical path are not dictated by this ICD. This ICD addresses only the application message content.

## 2. Telecommunications Requirements and Constraints

### 2.1 Use of Aeronautical Fixed Telecommunications Network (AFTN)

AFTN may be used for the flight data interface in Class 1 or Class 2, subject to verification of performance. Any interface exchanging radar/surveillance position data, including radar handoffs and point outs, shall not use AFTN.

When AFTN is used as the communications mechanism:

- a) The AFTN IA-5 Header as described in ICAO Annex 10, Aeronautical Telecommunications (Amendment 71) will be used for exchange of messages.
- b) ATS messages will be addressed to each ATS unit using an eight-character facility address where the first four characters are the appropriate location indicator from ICAO Doc. 7910, and the last four characters are routing indicators defined by the ATS unit in accordance with ICAO Annex 10.

Each message shall be sent with the priority indicated in Table 2 of Part II.

### 2.2 Use of a Wide-Area Network

Use of existing wide-area networks (e.g. using TCP/IP protocol) may be used if the speed, capacity, and security characteristics are verified as adequate to support the interface.

### 2.3 Use of Direct Lines

In cases where speed, capacity, and/or security require it, a direct line interface may be used between facilities.

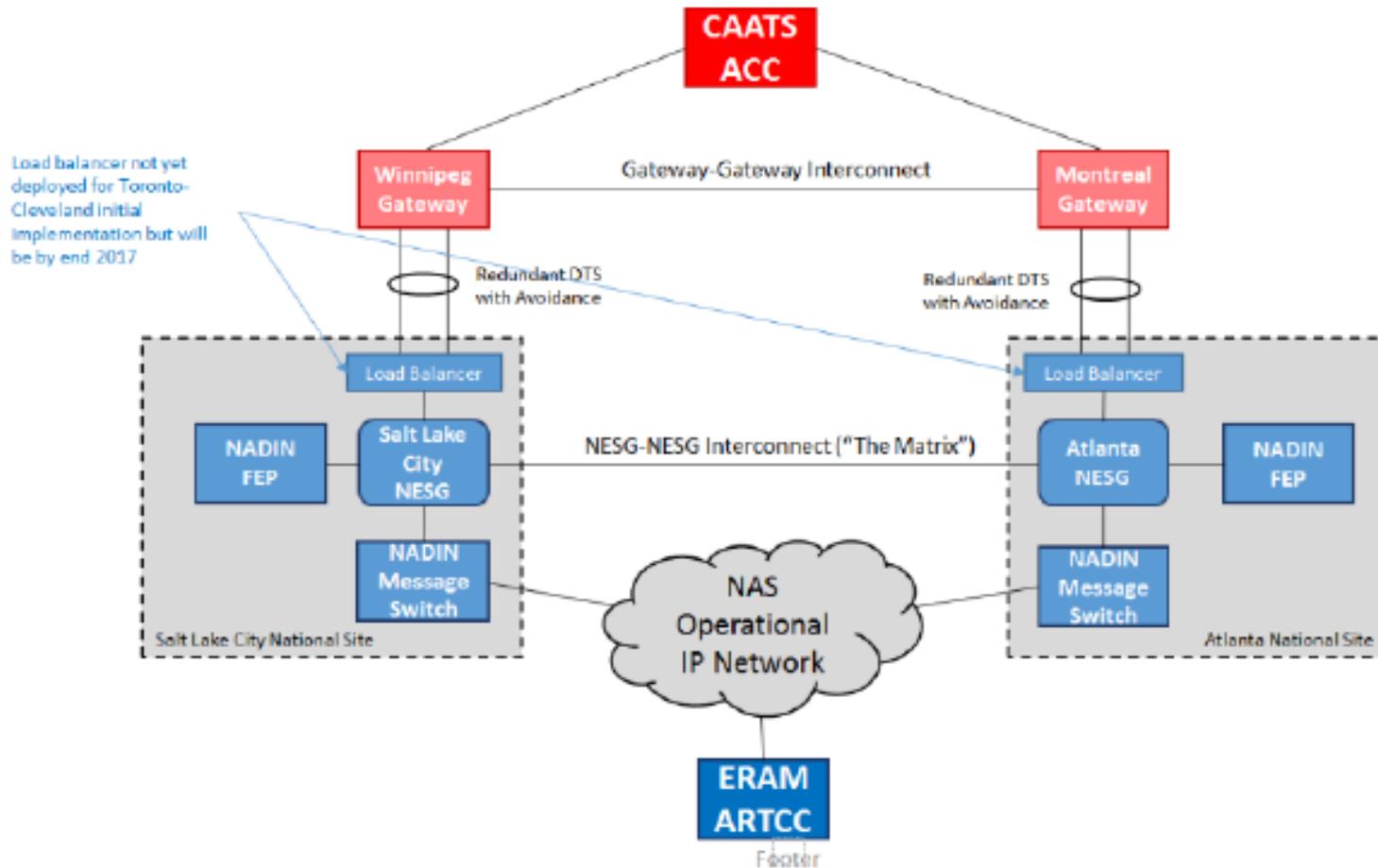
# Cross Border Communication

- Upgrade current AFTN to Internet Protocol (IP) and AMHS service
  - Direct IP service through NADIN MSN Replacement required
    - Load balancer is scheduled to extend the IP support for the ERAM
      - CAATS interfaces to NAV CANADA and SENEAM interfaces within the near term; testing is being planned for 2019 and implementing existing Class I and II messages using the new communications infrastructure to include the new system messages will be deployed 2020-2021
  - MEVA III is being looked at to support enhanced capabilities between the U.S. and NACC partners for future interface support

# Communications Interface Control Document and Interface Requirements Document

- **Interface Requirements Document (IRD)** NAS-IR-82422100 was prepared in accordance with FAA-STD-025f. It provides the **requirements to support Direct TCP/IP interfaces** between the En Route Automation Modernization (ERAM) system and Non-US ACC systems via the FAA NAS Enterprise Security Gateway (NESG) and the FAA Telecommunications Infrastructure (FTI).
- **Interface Control Document (ICD)** NAS-IC-82422100 was prepared in accordance with FAA-STD-025f. It specifies the **design characteristics to support Direct TCP/IP interfaces (NAM Direct IP)** between the En Route Automation Modernization (ERAM) system and Non-US Area Control Center (ACC) systems via the FAA NAS Enterprise Security Gateway (NESG) and the FAA Telecommunications Infrastructure (FTI).

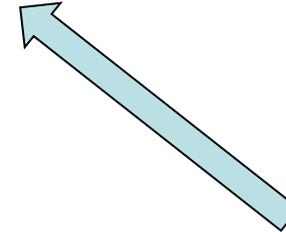
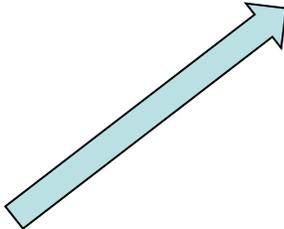
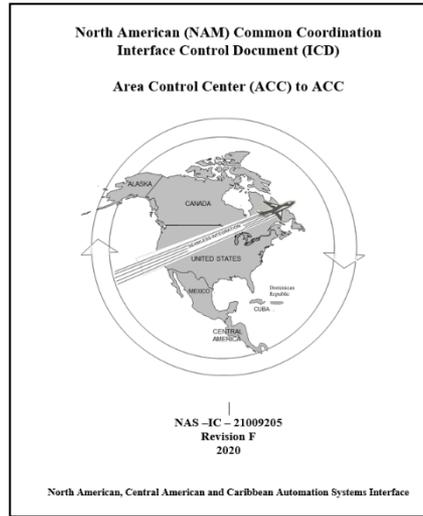
# Planned TCP/IP Messaging Connections



## NAM ICD Changes (Continued)

- No changes to NAM ICD Class I or Class II will be required to implement Class 1 or II interfaces
- Canada's request to adopt the NAM ICD system interface messages within Class 3 functionality was agreed to by the US
  - System messages include:
    - Initialization Request (IRQ) - Initiates interface activation
    - Initialization Response (IRS) - Response to IRQ
    - Termination Request (TRQ) - Termination of interface
    - Termination Response (TRS) - Response to TRQ
    - Application Status Monitor (ASM) - Confirms an adjacent system is online and working (heartbeat)
    - Logical Acknowledgement (LAM) - Acceptance of message, including an ASM

# NAM Boundary Agreements



**Attachment 2 CANADA/UNITED STATES BOUNDARY AGREEMENT**

**1. Introduction**  
This section documents the interface established between NAV CANADA and FAA en route automation systems.

**2. Message Implementation and Use**

**2.1 Messages Implemented**  
This boundary agreement addresses conditions for exchange of all flight data messages, LAM and LRM, and handoff messages.

**2.2 Conditions for Exchange**  
Flight plan messages (CPL or FPL) are exchanged between en route centers for flights that are IFR at the boundary. This includes the cases shown in Table Att. 2-1 below.

**Table 2-1 Summary of Flight Plan Routing in FAA and NAV CANADA Systems**

Direction of Flight	Flight Rules *	Flight Data Routing	FAA Routing
Canada to U.S.	I	CAATS to FAA EAS	none
	V	CAATS to FAA FSS	none
	Y (VFR after bdy)	CAATS to FAA EAS	EAS to FSS
	Y (VFR before bdy)	CAATS to FAA FSS	none
	Z (IFR after bdy)	CAATS to FAA FSS	FSS to EAS
	Z (IFR before bdy)	CAATS to FAA EAS	none
U.S. to Canada	I	FAA EAS to CAATS	none
	V	FAA FSS to CAATS	none
	Y (VFR after bdy)	FAA EAS to CAATS	none
	Y (VFR before bdy)	FAA FSS to CAATS	none
	Z (IFR after bdy)	FAA FSS to CAATS	none
	Z (IFR before bdy)	FAA EAS to CAATS	FSS to EAS

\* NOTE: FAA EAS and Canada will prohibit the transmission of composite flight plans procedurally. FAA EAS will determine the flight rules letter based upon the assigned or requested altitude. Therefore, flight plan messages from the FAA EAS to Canada will be based on the assigned or requested altitude.



**Attachment 7 DOMINICAN REPUBLIC/UNITED STATES BOUNDARY AGREEMENT**

**1. Introduction**  
This section documents the interface established between IDAC and FAA en route automation systems.

**2. Message Implementation and Use**

**2.1 Messages Implemented**  
This boundary agreement addresses conditions for exchange of all flight data messages, LAM and LRM, and handoff messages.

**2.2 Conditions for Exchange**  
Flight plan messages (CPL or FPL) are exchanged between en route centers for flights that are IFR at the boundary. This includes the cases shown in Table Att. 2-1 below.

**Attachment 3 CUBA/UNITED STATES BOUNDARY AGREEMENT**

**1. Introduction**  
This section documents the Class 1 interface between the IACC and FAA en route automation systems. The initial interface has limited message capability. Future evolutions are expected to include additional messages.

**2. Message Implementation and Use**

**2.1 Messages Implemented**  
The initial interface between the IACC and FAA EASs will be based on a Class 1 implementation of the Flight Data Coordination and Interface Management. Thus, the interface includes CPL, LAM and LRM messages. A CPL will be sent when a flight departs, or when it is within a VSP flying time from the boundary, whichever occurs later. Each CPL that is received and successfully checked for syntactic and semantic correctness is responded to with a LAM. LRM messages will be sent in response to failed CPLs and will contain the reason for rejection.

**2.2 Error Handling**  
A LAM is sent in response to each CPL unless the receiving EAS detects an error. The EAS that sent the CPL waits a VSP period of time for a LAM, and if none is received within the time parameter, it notifies the appropriate position that a failure occurred. Automatic retransmission of the message will not be attempted.

**2.3 Changes to a CPL**  
All changes to a previously sent CPL will be coordinated manually between the sending and receiving sectors.

**2.4 Field 08, Flight Rules and Type of Flight**  
Regardless of the value in Field 08(a), all CPLs sent on this interface will be assumed to be IFR at the boundary between Miami Center's airspace and Havana Center's airspace. Each center is only to send flight plans for flights that are IFR at the boundary. The FAA EAS processes only the IFR portion of the route in any flight plan, and does not forward flight plans to Flight Service Stations. Therefore any composite flight plan is expected to be filed by the user with both Flight Service and En Route Air Traffic Control.

**2.5 Field 09, Number and Type of Aircraft and Wake Turbulence Category**  
When a specific aircraft type is used, the wake turbulence indicator sent to the IACC system must match the value stored for the aircraft type in the IACC system database. When "ZZZZ" is used as the aircraft type, the wake turbulence category may be H, M, or L as appropriate.



# Attachment 2 CANADA/UNITED STATES BOUNDARY AGREEMENT

## Attachment 2 CANADA/UNITED STATES BOUNDARY AGREEMENT

### 1. Introduction

This section documents the interface established between NAV CANADA and FAA en route automation systems.

### 2. Message Implementation and Use

#### 2.1 Messages Implemented

This boundary agreement addresses conditions for exchange of all flight data messages, LAM and LRM, and handoff messages.

#### 2.2 Conditions for Exchange

Flight plan messages (CPL or FPL) are exchanged between en route centers for flights that are IFR at the boundary. This includes the cases shown in Table Att. 2-1 below:

**Table 2-1 Summary of Flight Plan Routing in FAA and NAV CANADA Systems**

Direction of Flight	Flight Rules *	Flight Data Routing	FAA Routing
Canada to U.S.	I	CAATS to FAA EAS	none.
	V	CAATS to FAA FSS	none.
	Y (VFR after bdry)	CAATS to FAA EAS	EAS to FSS
	Y (VFR before bdry)	CAATS/ to FAA FSS	none.
	Z (IFR after bdry)	CAATS to FAA FSS	FSS to EAS
	Z (IFR before bdry)	CAATS to FAA EAS	none.
U.S. to Canada	I	FAA EAS to CAATS	none.
	V	FAA FSS to CAATS	none.
	Y (VFR after bdry)	FAA EAS to CAATS	none.
	Y (VFR before bdry)	FAA FSS to CAATS	none.
	Z (IFR after bdry)	FAA FSS to CAATS	none.
	Z (IFR before bdry)	FAA EAS to CAATS	FSS to EAS.

\* NOTE: FAA EAS and Canada will prohibit the transmission of composite flight plans procedurally. FAA EAS will determine the flight rules letter based upon the assigned or requested altitude. Therefore, flight plan messages from the FAA EAS to Canada will be based on the assigned or requested altitude.

### 2.3 Aerodrome Designators (Fields 13 and 16)

ATTACHMENT 2

2-4

# NAM ICD Boundary Agreement Examples

- Examples of some boundary agreement changes will include:
  - Field 07(c) Implementation in RTI, RTU, and POI Messages
    - If the track for the flight does not have an **established beacon code**, RTI messages will not be sent.
    - If the **beacon code** for a flight in handoff **becomes dis-established**, RTU messages will not be sent.
    - RTU messages **will resume** if the beacon code becomes established while the flight is in handoff

## Examples of some boundary agreement changes will include (cont)

- Field 32 Implementation in RTI, RTU, and POI Messages
  - Field 32, including all subfields, is included in RTI, RTU, and POI messages
  - If the track for the flight being handed off or pointed out does not have an established **ground speed**, Field 32(c) will be set to N9999.
  - If the track for the flight being handed off or pointed out does not have an established **heading**, Field 32(d) will be set to 99999.
  - If the track for the flight does not have an established reported **altitude**, RTI and POI messages will not be sent.
  - If the **reported altitude** for a flight in handoff becomes **dis-established**, RTU messages will not be sent. RTU messages will resume if the reported altitude becomes established while the flight is in handoff.

# Attachment 2 CANADA/UNITED STATES BOUNDARY AGREEMENT

## 2.10 IRQ

When initializing the interface, IRQ messages will be sent periodically until an IRS response message is received or the initialization is aborted. The message number will increment in repeated IRQ messages sent on this interface.

## 2.11 TRQ

Field 18 of all TRQ messages sent on this interface will be set to 0 (zero) to indicate that there is no Other Information.

## 2.12 TRS

Field 18 of all TRS messages sent on this interface will be set to 0 (zero) to indicate that there is no Other Information.

## 2.13 ASM

### 2.13.1 ASM Message Purpose

The ASM message indicates that the sending center's ATC application is online as well as requesting a response from the receiving center indicating that its ATC application is online. The description of the ASM message purpose does not fully capture this. It is the understanding of NAV CANADA and the FAA that the purpose of the ASM message should read:

The ASM message is sent to an adjacent center to indicate that the sending center's ATC application is online and to confirm that the adjacent center's ATC application is online. The ASM is transmitted when no other application messages have been received within an adaptable time. The periodic interval between transmissions of the ASM message should be determined based on the needs of the operational environment.

### 2.13.2 ASM Message Format

The ASM message is generated asynchronously and is not referent to any other message. Therefore, all ASM messages sent on this interface will not include Field 3(c), Reference Data.

# Attachment 2 CANADA/UNITED STATES BOUNDARY AGREEMENT

## 2.17 RTA

In support of Controller Pilot Data Link Communications (CPDLC), NAV CANADA and the FAA have agreed to add field 31c as an optional field in the RTA. Field 31c will contain the information necessary to build and uplink a Contact (uM117) message to the aircraft to transfer voice communications to the new controlling facility and sector.

Field 31c will always be included in an RTA message to accept a handoff. Field 31c will not be included in an RTA message to retract a handoff.

Field 31c will consist of three subfields separated by slash (/) characters: Frequency/Facility Name/Facility Function

Frequency will be 4 – 7 characters in length and will contain either a VHF or HF frequency.

- VHF frequency is 7 characters in length with units of megahertz (MHz)
  - Format is ddd.ddd
  - Range is 118.000 to 136.975 MHz in increments of 000.025 MHz
- HF frequency is 4 – 5 characters in length with units of kilohertz (KHz)
  - Format is dddd(d)
  - Range is 2850 – 28000 KHz in increments of 1 KHz
- A value of 000.000 indicates that no frequency is provided.

Facility Name will be 3 – 18 characters in length and may contain ASCII digits (0...9), uppercase ASCII letters (A...Z), and space characters ( ).

Facility Function will be a single ASCII digit with 0 meaning Center and 1 meaning Approach.

The maximum length of Field 31c is increased to 28 characters.

- Frequency
- Facility Name
- Facility Function

# Attachment 2 CANADA/UNITED STATES BOUNDARY AGREEMENT

## 2.22 LRM Error Codes

The addition of radar handoff messages to this interface required additional message validation and the definition of additional error codes for the LRM message. The following table contains the error codes to be used between the FAA EAS and the NAV CANADA EAS. Text in green shows the additions and modifications to support the radar handoff messages.

**Table 2-2 LRM Error Codes and Explanations**

Error Code	Field Number	Supporting Text	Required for Handoff Messages?		Notes
			E2C	C2E	
1	Header	INVALID SENDING UNIT	No		For example, invalid, AFTN address.
2	Header	INVALID RECEIVING UNIT	No		For example, invalid, AFTN address.
3	Header	INVALID TIME STAMP	No		Applies to NADIN interface.
4	Header	INVALID MESSAGE ID	No		N/A to ERAM/CAATS interface. See Error 60 for ERAM/CAATS interface equivalent (INVALID
5	Header	INVALID REFERENCE ID	No		
6	07	INVALID ACID	Yes	Yes	The error is returned when the flight AID and reference data in a message other than an RTA does not map to an existing flight plan. Also returned if an RTA is received and the reference data is not associated with a previous RTI.
7	07	DUPLICATE ACID	Yes	Yes	Returned if syntax check of field 7a fails.
8	07	UNKNOWN FUNCTIONAL ADDRESS	No		This will occur in CAATS for non-unique flight.

## Attachment 2 CANADA/UNITED STATES BOUNDARY AGREEMENT

9	07	INVALID SSR MODE	Yes	No	Returned if syntax check of field 7a fails or the SSR mode in Field 07b of an RTI message is not "A".
10	07	INVALID SSR CODE	No	No	Reject is for the SSR code not being a 4 digit octal.
11	08	INVALID FLIGHT RULES	No		
12	08	INVALID FLIGHT TYPE	No		
13	09	INVALID AIRCRAFT MODEL	No		
14	09	INVALID WAKE TURBULENCE CATEGORY	No		
15	10	INVALID CNA EQUIPMENT DESIGNATOR	No		
16	10	INVALID SSR EQUIPMENT DESIGNATOR	No		
17	13, 16	INVALID AERODROME DESIGNATOR	No		Applies to CHG an MOD that amends Field 13a or 16a to "ZZZZ" without there being a valid DEP/ or DEST/ indicator.
18	13	INVALID DEPARTURE AERODROME	Yes	No	Returned if syntax check of field 13a fails
19	16	INVALID DESTINATION AERODROME	Yes	No	Returned if syntax check of field 16a fails
20	17	INVALID ARRIVAL AERODROME	No		

## Attachment 2 CANADA/UNITED STATES BOUNDARY AGREEMENT

Error Code	Field Number	Supporting Text	Required for Handoff Messages?		Notes
			E2C	C2E	
21	13, 16	EXPECTED TIME DESIGNATOR NOT FOUND	No		
22	13, 16	TIME DESIGNATOR PRESENT WHEN NOT EXPECTED	No		Syntax check.
23	13, 14, 16	INVALID TIME DESIGNATOR	No		
24	13, 14, 16	MISSING TIME DESIGNATOR	No		
25	14	INVALID BOUNDARY POINT DESIGNATOR	No		
26	14, 15	INVALID ENROUTE POINT	No		
27	14, 15	INVALID LAT/LON DESIGNATOR	No		
28	14, 15	INVALID NAVAID FIX	No		
29	14, 15	INVALID LEVEL DESIGNATOR	No		
30	14, 15	MISSING LEVEL DESIGNATOR	No		
31	14	INVALID SUPPLEMENTARY CROSSING DATA	No		
32	14	INVALID SUPPLEMENTARY CROSSING LEVEL	No		
33	14	MISSING SUPPLEMENTARY CROSSING LEVEL	No		
34	14	INVALID CROSSING CONDITION	No		
35	14	MISSING CROSSING CONDITION	No		
36	15	INVALID SPEED/LEVEL DESIGNATOR	No		
37	15	MISSING SPEED/LEVEL DESIGNATOR	No		

## Attachment 2 CANADA/UNITED STATES BOUNDARY AGREEMENT

Error Code	Field Number	Supporting Text	Required for Handoff Messages?		Notes
			E2C	C2E	
38	15	INVALID SPEED DESIGNATOR	No		
39	15	MISSING SPEED DESIGNATOR	No		
40	15	INVALID ROUTE ELEMENT DESIGNATOR	No		
41	15	INVALID ATS ROUTE/SIGNIFICANT POINT DESIGNATOR	No		
42	15	INVALID ATS ROUTE DESIGNATOR	No		
43	15	INVALID SIGNIFICANT POINT DESIGNATOR	No		
44	15	FLIGHT RULES INDICATOR DOES NOT FOLLOW SIGNIFICANT POINT	No		
45	15	ADDITIONAL DATA FOLLOWS TRUNCATION INDICATOR	No		
46	15	INCORRECT CRUISE CLIMB FORMAT	No		
47	15	CONFLICTING DIRECTION	No		
48	18	INVALID OTHER INFORMATION ELEMENT	No		
49	19	INVALID SUPPLEMENTARY INFORMATION ELEMENT	No		

## Attachment 2 CANADA/UNITED STATES BOUNDARY AGREEMENT

Error Code	Field Number	Supporting Text	Required for Handoff Messages?		Notes
			E2C	C2E	
50	22	INVALID AMENDMENT FIELD DATA	No		
51	Two numerics	MISSING FIELD (two numerics)	No		Applies to CHG and MOD only or for a message that requires Field 15 and 15c.
52		MORE THAN ONE FIELD MISSING	Yes	No	A message is received that contains less than the required number of fields. ERAM currently uses MESSAGE TOO SHORT for the supporting text.
53		MESSAGE LOGICALLY TOO LONG	No		Syntax check for too many fields.
54		SYNTAX ERROR IN FIELD 00	No		Syntax check.
55		INVALID MESSAGE LENGTH	No		
56		NAT ERRORS	No		
57		INVALID MESSAGE	Yes	Yes	Returned if field 3 in RTI, RTA, RLA, RTA or RTU fails to pass syntax validation (more than 2 slants in the field).
58		MISSING PARENTHESIS	No		Syntax check.
59		MESSAGE NOT APPLICABLE TO zzzz ACC	Yes	No	A handoff related message is received from a CAATS ACC and the recipient ERAM has handoff disabled with that ACC.
60	03	INVALID MESSAGE MNEMONIC (i.e., 3 LETTER IDENTIFIER)	No	No	Applied to non-US messages that are received from a CAATS ACC and the message is not eligible for exchange over the interface.

# Attachment 2 CANADA/UNITED STATES BOUNDARY AGREEMENT

Error Code	Field Number	Supporting Text	Required for Handoff Messages?		Notes
			E2C	C2E	
61	Header	INVALID CRC	No		CRC checking happens at IP layer, but TCP requests retries and thus isolates that from application.
62		MESSAGE REJECTED, MANUAL COORDINATION REQUIRED	Yes	No	A software error has been encountered in the receiving ERAM. This behavior exists currently in ERAM and applies to all message types including handoff related messages.
63	18	INVALID DATE OF FLIGHT	No		
64	10	INCONSISTENT ITEM 10 AND 18	No		
65	10	INVALID ADS-B EQUIPMENT DESIGNATOR	No		
66	10	INVALID ADS-C EQUIPMENT DESIGNATOR	No		

## Attachment 2 CANADA/UNITED STATES BOUNDARY AGREEMENT

Error Code	Field Number	Supporting Text	Required for Handoff Messages?		Notes
			E2C	C2E	
67		ICAO FORMAT MIXED IN MESSAGE	No		A message was received containing ICAO data fields in which there was a mixture of both Present and New format of ICAO data.
68		MUST ENTER NEW ICAO FORMAT	No		A message was received containing ICAO data in the Present format, but the ERAM is only accepting the New format. Only ICAO data in the New format is permitted.
69		Deleted NAM Version 'E'-MUST ENTER OLD ICAO FORMAT	No		A message was received containing ICAO data in the New format, but the ERAM is only accepting the Present format. Only ICAO data in the old (Present) format is permitted.

# Attachment 2 CANADA/UNITED STATES BOUNDARY AGREEMENT

Error Code	Field Number	Supporting Text	Required for Handoff Messages?		Notes
			E2C	C2E	
70		ICAO FORMAT CANNOT BE CHANGED	No		A CHG or MOD message was received in which there was a mismatch between some of the received ICAO data and the stored ICAO format of the flight.
71	10	DUPLICATE EQP EQUIP DESIGNATOR	No		EQP contains repetition of values.
72	10	DUPLICATE SRV EQUIP DESIGNATOR	No		SRV contains repetition of values.
73	10	INVALID EQP EQUIP DESIGNATOR	No		EQP contains invalid values.
74	10	INVALID SRV EQUIP DESIGNATOR	No		SRV contains invalid values.
75	10	INVALID EQP EQUIP DESIGNATOR COMBINATION	No		EQP contains invalid combination of values.

## Attachment 2 CANADA/UNITED STATES BOUNDARY AGREEMENT

Error Code	Field Number	Supporting Text	Required for Handoff Messages?		Notes
			E2C	C2E	
76	10	INVALID SRV EQUIP DESIGNATOR COMBINATION	No		SRV contains invalid combination of values.
77	18	INVALID PBN Data	No		PBN/ contains invalid values.
78	10a	EQP EQUIP DESIGNATOR EXCEEDS 50 CHR	No		
79	10b	SRV EQUIP DESIGNATOR EXCEEDS 20 CHR	No		
80	13/18	DEP/ NOT FOUND FOR ZZZZ	No		
81	15/10a	NO RVSM STATUS	No		
82	16/18	DEST/ NOT FOUND FOR ZZZZ	No		
83	18	INVALID ELEMENT ON STS/	No		
84	18	PBN/ VALUE EXCEEDED OR INVALID (MORE THAN 8)	No		
85	18	INVALID EET DATA	No		
86	18	PBN VALUE INCONSISTENT WITH ITEM 10	No		
87	16	ALTERNATE AERODROME PRESENT WHEN NOT EXPECTED	No		
88		FPL IS ACTIVE	No		A message is received after an FPL becomes active. In CPL cases, no CPL flag has been marked.

## Attachment 2 CANADA/UNITED STATES BOUNDARY AGREEMENT

Error Code	Field Number	Supporting Text	Required for Handoff Messages?		Notes
			E2C	C2E	
89		Deleted –NAM ICD Version E. DUPLICATED MESSAGE	No		
90	9/18	TYP/ NOT FOUND FOR ZZZZ	No		
91	10a/18	INCONSISTENT ITEM 10 and 18	No		R, G, Z with no specification in field 18.
92-98		Reserved for future use.			
99		RECEIVING SECTOR ID NON EXISTENT	Yes	Yes	A directed handoff initiate message is received and the recipient sector does not exist in the local ERAM or CAATS adaptation.
100		FLIGHT NOT CORRELATED	No	Yes	CAATS sends this when a flight is not associated with a surveillance track. Not used ERAM to CAATS.
101		TRACK MISMATCH	Yes	Yes	ERAM and CAATS reject an RTI if the received track data does not match the local track data.

## Attachment 2 CANADA/UNITED STATES BOUNDARY AGREEMENT

Error Code	Field Number	Supporting Text	Required for Handoff Messages?		Notes
			E2C	C2E	
102		NO TRACK DATA AVAILABLE FOR TRACK	Yes	No	Covers a scenario where an RTI is received and the flight is not paired in the recipient ERAM and a local track cannot be created using the track data in the RTI. E.g., the ERAM tracker is tracking the maximum number of tracks.
103		NO HANDOFF IN PROGRESS	Yes	Yes	Returned if an accept handoff is received for a flight that is not in handoff.
104		FLIGHT NOT AIRBORNE	Yes	Yes	An RTI is received and the flight plan is not active.
105		EXPECTED PROFILE DOES NOT EXIST (AMIR)	No	Yes	Not used ERAM to CAATS.  CAATS: Attempt to Hand Off a flight for which flight data is incomplete (minimal flight plan).

## Attachment 2 CANADA/UNITED STATES BOUNDARY AGREEMENT

Error Code	Field Number	Supporting Text	Required for Handoff Messages?		Notes
			E2C	C2E	
107		RECEIVING JURISDICTION IS NIL	No	Yes	<p>Not used ERAM to CAATS.</p> <p>CAATS: A flight is handed off to the unit only and therefore the receiving unit needs to determine the receiving sector. CAATS determines that the next sector is not within the receiving unit.</p>
108		EXTERNAL REQUESTOR BUT JURISDICTION IS LOCAL	Yes	Yes	<p>ERAM: An RTI is received for a flight that is controlled by a local sector and the handoff is neither 1) directed to the controlling sector nor 2) undirected and the controlling sector is the derived recipient. Also applies if the recipient ERAM has recently performed a steal control action. Handoff to the controlling sector is not allowed until an amendment is entered by the controlling sector.</p> <p>CAATS: An RTI is received for a flight that is controlled by a local sector.</p>
109		HANDOFF ALREADY IN	Yes	Yes	<p>ERAM: An RTI is received for a flight that is controlled by a local sector and the handoff is neither 1) directed to the controlling sector nor 2) undirected and the controlling sector is the derived recipient. Also applies if the recipient ERAM has recently performed a steal control action. Handoff to the controlling sector is not allowed until an amendment is entered by the controlling sector.</p> <p>CAATS: An RTI is received for a flight that is controlled by a local sector.</p>

## Attachment 2 CANADA/UNITED STATES BOUNDARY AGREEMENT

Error Code	Field Number	Supporting Text	Required for Handoff Messages?		Notes
			E2C	C2E	
109		HANDOFF ALREADY IN PROGRESS FOR THE FLIGHT	Yes	Yes	An RTI is received and the flight is currently in handoff with either a local sector or local ARTS as the handoff originator/recipient.
110		NO RECEIVING JURISDICTION ON PROFILE WITHIN THE HANDOFF DETERMINATION PERIOD	No	Yes	Not used ERAM to CAATS.  CAATS: Flight is too far (adaptable) from the receiving unit and therefore CAATS has not yet calculated the first intersected sector. If this error occurs, the initiator would have to specify a receiving sector to successfully perform the handoff.
111		RECEIVING SECTOR IS NOT CONFIGURED FOR RADAR HANDOFF	Yes	No	The final handoff recipient sector does not have an adapted R-position (radar handoff, therefore, is not allowed).
112		RECEIVING FACILITY ID NON EXISTENT	Yes	No	The recipient facility identified in Field 31 of an RTI message does not exist in the local ERAM's adaptation.

## Attachment 2 CANADA/UNITED STATES BOUNDARY AGREEMENT

Error Code	Field Number	Supporting Text	Required for Handoff Messages?		Notes
			E2C	C2E	
113		INCORRECT LEG	Yes	No	A handoff initiate can be accepted by ERAM for a non-basis plan if, for example, a flight has been handed off outbound (Leg 1) and an RTI is then received for the next re-entrant plan (Leg 2). However, ERAM also expects handoffs to be performed in an orderly manner. In the above example, an RTI received on a Leg 3 plan would be rejected.
114		HANDOFF ROUTING FAILURE	Yes	No	ERAM is unable to determine a handoff recipient sector or facility.
115		ALREADY HANDED OFF OUTBOUND	Yes	No	An RTI will not be accepted for a flight that ERAM has previously controlled and handed off to an external facility.
116		FLIGHT NOT BEACON EQUIPPED	Yes	No	An RTI is rejected if a beacon code cannot be assigned. This should be limited to cases where the flight is not beacon equipped.

Error Code 57 shall be used for any error that is not field-specific and is not identified in the table. Each country may propose additional error codes as needed.

# 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. Taking a harmonized approach with other service providers and ATC automated 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. Implementing automation enhancements provides an increased level of service while standardizing automated data exchange technologies and procedures in the region. Sharing the technology and automation skills gained is critical to cross-border, regional and multi-regional interoperability.
- A harmonized system and region cannot be built without developing partnerships with our international counterparts.

