Evolution of the United States Automated Data Exchange (ADE) Interfaces within the North American, Central American and Caribbean (NACC) Region – 2017 Update

Presented To: ICAO NACC AIM/AIDC Task Force/FPL Monitoring Group

By: Dan Eaves, FAA En Route Requirements and Validations

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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 Centers.
ATS Interfacility Data Communication (AIDC)

- The ATS Interfacility Data Communication (AIDC) NAM ICD Version ‘E’ document 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 described functionality is adept at supporting radar/surveillance and mixed domestic transition environments. The traditional AIDC message set is more attuned to oceanic operations where more controller interaction is required. In most NAM interoperability environments, radar is the operational norm and non-radar the exception. Radar handoff culminates the NAM ICD process in achieving voiceless automated data exchange across international boundaries.
Outline

• US International Automation Interface Initiatives

• Ongoing ICAO North American, Central American and Caribbean (NACC) Regional interface activities

• Infrastructure Automation Progress
NACC AIDC - 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.
- AIDC protocol is only used in 1 US NACC Oceanic interface Oakland ATOP – Mazatlán ACC
Working the ‘New’ 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 Interface between Havana – Miami is being up levelled on the Cuba side to Class 2 with testing expected to begin early 2018.
• The US and Canada are also working the interface of New York Oceanic’s ATOP with Moncton ACC CAATS using the NAM ICD protocol. Software upgrade in 2018 to support the interface.
• New York Oceanic is also working toward implementing an AIDC interface with Piarco ACC. San Juan and New York Oceanic have borders with Piarco.
2017 US Interface Initiatives
En Route/Oceanic Systems

Anchorage ARTCC Oceanic
Canada Edmonton ACC
Canada Vancouver ACC Moncton ACC
New York ARTCC - Oceanic
Oakland ARTCC Oceanic
Dominican Republic Santo Domingo ACC
Mexico Mazatlan ACC
Cuba Havana ACC
Trinidad and Tobago Piarco ACC
# Annual US – NACC FIR Border Crossings

<table>
<thead>
<tr>
<th>FIRs</th>
<th>Traffic</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada</td>
<td>2,400,000</td>
<td>6 FIRs</td>
</tr>
<tr>
<td>Mexico</td>
<td>410,000</td>
<td>3 FIRs</td>
</tr>
<tr>
<td>Habana</td>
<td>245,000</td>
<td>ZMA</td>
</tr>
<tr>
<td>Santo Domingo</td>
<td>171,000</td>
<td>ZMA &amp; ZSU</td>
</tr>
<tr>
<td>Piarco</td>
<td>82,000</td>
<td>ZNY &amp; ZSU</td>
</tr>
<tr>
<td>Maiquetia</td>
<td>13,000</td>
<td>ZSU</td>
</tr>
<tr>
<td>Curacao</td>
<td>6,900</td>
<td>ZSU</td>
</tr>
</tbody>
</table>
### US Automated Interfaces

- US Operational Interfaces within NACC (green shading) totals indicated; 21 NAM and 2 AIDC

<table>
<thead>
<tr>
<th>Neighboring FIR</th>
<th>Operational Interfaces</th>
<th>NAM</th>
<th>AIDC</th>
<th>Pending</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada FIRs</td>
<td>16</td>
<td>15</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Mexico FIRs</td>
<td>6</td>
<td>5</td>
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<tr>
<td>Habana FIR</td>
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<td>1</td>
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<tr>
<td>Japan FIR</td>
<td>2</td>
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<td>2</td>
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<tr>
<td>Santo Domingo FIR</td>
<td></td>
<td></td>
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<td>1</td>
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<tr>
<td>Piarco FIR</td>
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<td></td>
<td>1</td>
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<tr>
<td>Santa Maria FIR</td>
<td>1</td>
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<td>1</td>
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<tr>
<td>Port Au Prince FIR</td>
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<tr>
<td>Russia FIR</td>
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<tr>
<td>Maiquetia FIR</td>
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<tr>
<td>Port Moresby FIR</td>
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<tr>
<td>Auckland Oceanic FIR</td>
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<tr>
<td>Curacao FIR</td>
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<tr>
<td>Manila FIR</td>
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<tr>
<td>Nadi FIR</td>
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<tr>
<td>Tahiti FIR</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
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<tr>
<td>Nauru FIR</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
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<tr>
<td>Ujung Pandang FIR</td>
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<tr>
<td><em>Note: Anchorage and Oakland have an AIDC connection</em></td>
<td>1</td>
<td>21</td>
<td>10</td>
<td>3</td>
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<tr>
<td><strong>Grand Total</strong></td>
<td><strong>31</strong></td>
<td><strong>21</strong></td>
<td><strong>10</strong></td>
<td><strong>3</strong></td>
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</tbody>
</table>
North American Common Interface Control Document (NAM ICD)

- NAM ICD Automated Data Exchange has been implemented between 5 member states and 23 NACC FIRs to include US, Mexico, Canada, Cuba and Honduras (COSESNA). Operational NAM ICD Interfaces Include:
  
  - **Canada – US 14**
    - North America Domestic 11
    - Anchorage 2
    - Oakland Oceanic (ATOP) - Vancouver ACC 1
    - New York Oceanic (ATOP) – Moncton ACC (Pending)
  
  - **Mexico - 7**
    - US 5
    - Cuba 1
    - COCESNA 1
  
  - **Cuba – 3**
    - US 1
    - Mexico (Merida) 1
    - COCESNA 1
Infrastructure Automation Evolution
Two trans-border Automation interface Initiatives are ongoing with the United States

- Eastern Regional Task Group (ERTG) Caribbean Initiative
- NAM ICD Class 3 Handoff between US & Canada
Projected Growth

- FAA Performance Analysis Group projects ZMA only Center projected to grow by 2019
- ZSU expectations are similar
- \textit{Source: FAA AJR-G Five Year Projection (FYRP) for the NAS}

\begin{center}
\textbf{Projected Change in Center Activity, 2014-2019}
\end{center}

- Overall Center activity is projected to be 4% lower in 2019 than 2014
- However the number of operations at ZMA is expected to increase 1.3% from 2014 to 2019
Background to ERTG Tasking

- Ongoing stakeholder concern regarding safety and operational performance in the Caribbean
Eastern Regional Task Group (ERTG)
Infrastructure: Automation

Recommendations

- Regional Implementation of Automation:
  - Continue implementation of ADE with Santo Domingo
  - Explore software translation for neighboring facilities with AIDC protocol
  - Ensure ERAM software upgrades associated with ADE stay on schedule
  - Implement Independent Flight Data Processing in ZSU

Automation Interface Protocols between/within NAS and Foreign Facilities in Caribbean
# ERTG Recommendations

<table>
<thead>
<tr>
<th>Category</th>
<th>Prioritized Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Communications</strong></td>
<td>Implement a New Communications Frequency at Saint Maarten</td>
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<td></td>
<td>Implement a New Communications Frequency at Abaco Island</td>
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<td></td>
<td>Install Dedicated Shout Lines with Certain Adjacent or Underlying International Facilities</td>
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<tr>
<td><strong>Automation</strong></td>
<td>Regional Implementation of Automation:</td>
</tr>
<tr>
<td></td>
<td>1. Continue implementation of ADE with Santo Domingo</td>
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<tr>
<td></td>
<td>2. Develop software translation for neighboring facilities with AIDC protocol</td>
</tr>
<tr>
<td></td>
<td>3. Ensure ERAM software upgrades associated with ADE stay on schedule</td>
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<tr>
<td></td>
<td>Implement Independent Flight Data Processing in ZSU</td>
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<tr>
<td><strong>Surveillance</strong></td>
<td>Implement ADS-B in the Caribbean</td>
</tr>
<tr>
<td></td>
<td>Input St. Maarten Radar into the ZSU Radar Mosaic System</td>
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<td></td>
<td>Identify and Access a Backup Option for Grand Turk Radar</td>
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<tr>
<td><strong>Technology Improvements</strong></td>
<td>Investigate Option to Access Weather Information from Long Range DoD/DHS Radars</td>
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<tr>
<td></td>
<td>If the Offshore Precipitation Capability (OPC) shows promise, expedite Caribbean access</td>
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<td></td>
<td>Enable ZSU to Participate in Data Comm</td>
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<td></td>
<td>Make Caribbean Radar Presentations Available to ZNY</td>
</tr>
<tr>
<td><strong>Airspace Priorities</strong></td>
<td>Explore Options to Reduce Separation between ZNY and ZSU/ZMA</td>
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<td></td>
<td>Implement a Shortcut Route between CARPX and RENAH</td>
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<td></td>
<td>Conundr Integrated Redesign of ZMA and ZSU Airspace</td>
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<td></td>
<td>Improve Short Term Cuba Access in the Giron Corridor</td>
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<td></td>
<td>Prepare for Significant Growth in Cuba Operations</td>
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<tr>
<td><strong>Harmonization</strong></td>
<td>FAA should establish one body to develop an integrated plan and lead implementation in the Caribbean</td>
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<td></td>
<td>Maintain Active Coordination with ICAO’s North America, Central America and Caribbean Offices</td>
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<td></td>
<td>Ensure Active Involvement of the Office of International Affairs, Western Hemisphere Office</td>
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</table>
RTCA Eastern Regional Task Group’s recommendation for an integrated redesign of ZMA and ZSU airspace
US - Canada Cross Border Handoff

• Since NAM ICD handoff model was taken from US domestic capability, US – Canada was scheduled to partner for development of the technical cross border solution.

• Ongoing Technical Interchange Meetings (TIMs) are defining how each system will process the handoff messages and the international communications infrastructure design.

• 2017 Meetings have included multiple telecons and face to face meetings in:
  - FAA HQ Washington DC
  - NAV CANADA HQ Ottawa, Ontario

• The timeline for handoff implementation defines engineering tasks in 2018, software development in 2019 and implementation in 2020.
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)
  • Logic Reject Message (LRM)

• Class 3 Capabilities
  • Radar Handoff (via RTI, RTU, RTA, RLA)
  • Point Outs (via POI, POA, POJ)
  • Application Status Message (new ASM message)
Handoff Development – NAM ICD Tip of the Iceberg

- What, Where, How and Why represents the bulk of the adaptation and processing of handoff functionality
Handoff Developmental Interest Items

• NAM Telecommunication - Direct Connectivity Required
  • Due to real time track messaging per NAM ICD

• NAM ICD Messages should be software selectable to maintain capability flexibility with adjacent ANSPs

• First Order Dependency of Interface Messages
  • CPL Success Required/ FPL-EST Success Required

• US – Canada NAM ICD Boundary Agreement to capture specific handoff usage items being used; derived lessons learned
Handoff - First Order Dependency of Interface Messages

CPL Success Required

CPL → LAM

FPL-EST Success Required

FPL → LAM → EST → LAM

For Automation Handoff

RTI - RLA - RTU - RTA – LAM
or LRM
or LRM

ANSP1

ANSP2
Cross Border Communication for Handoff

- Upgrade current AFTN to Internet Protocol (IP) and AMHS service
  - Direct IP service through NADIN MSN Replacement required
  - Existing US-Canada interface is scheduled to transition to IP for existing ERAM – CAATS within the near term; waterfall currently being worked expected complete by end of 2017
    - These interfaces will be modified to support direct IP connectivity for cross border handoff
- MEVA III is being looked at to support enhanced capabilities between the US and NACC partners for future interface support
Handoff Developmental Interest Items

• Use of System Messages – not mandated but support for facility-facility handoff interconnection recommended when using NAM ICD handoff protocol

  • IRQ
  • IRS
  • TRQ
  • TRS
  • ASM
Handoff Interest Items

- Surveillance Coverage
- Coincidence of tracks
  - How close is close enough?
- Directing the Handoff to facility or sector
- What fields to error check beyond format/syntax
- System to system differences
Conclusion

• Substantial progress has been made in interfacing between the NACC neighbor countries but pending NAM ICD capabilities will move users into significantly increased automation compatibility and efficiency.

• The AIDC automation activity has a direct benefit on our collective ability to provide more efficient and seamless service. Automation enhances our safety and efficiency interests extending beyond the borders of our airspace and systems. Operational efficiencies gained in contiguous automated airspace benefit aircraft service providers and the flying public.

• 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.