

CANADA's FF-ICE Implementation

Presented by:

Jason Rossiter

NAV CANADA

Director, TBO Architecture & Systems Engineering

February 19, 2026



Serving a world in motion
Au service d'un
monde en mouvement
navcanada.ca





- 1 FF-ICE Capabilities
- 2 Evaluation Process
- 3 FIXM Format Observations
- 4 Connectivity Architecture
- 5 NAT Opportunities



Canadian Domestic Airspace (CDA)

✓ FF-ICE Planning = **Mature**
(FDP = CAATS)

Gander Oceanic Control Area (OCA)

● FF-ICE Planning = **Less Mature**
(FDP = GAATS)



Regional Environment

Canadian Domestic Airspace (CDA)

ICAO **NAM** Region

Transport Canada (TC) = National Regulator

Gander Oceanic Control Area (OCA)

ICAO **NAT** Region

Canada is also responsible for providing ANS over non-sovereign high seas NAT airspace.

NAV CANADA's Strategic Direction

TBO represents one of the key strategic priorities that will transform how we deliver service. FF-ICE is a core element of that vision.



Trajectory-Based Operations (TBO)

Building a system that takes into account the full picture of a flight.



Airspace Modernization

Re-thinking our airspace holistically, while accounting for our customers' desired routes.



Digital Facilities (DAATS)

Moving beyond traditional human line-of-sight to rethink how we deliver service and where we deliver it from.

NAV CANADA's FF-ICE Transition Timeline

2029



TTX / Trials / Demos from Q1/2021

Elaboration and Execution of FF-ICE/R1 regional transition plans from Q1/2024

States begin implementation of FF-ICE/R1 Q1 2025

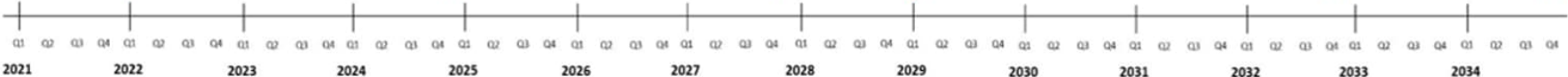
Submission of FF-ICE/R1 to ANC Q1 2022

Applicability of FF-ICE/R1 Q4 2024

ICAO to cease upgrades to non-critical upgrade to FPL 2012 Q4 2027

Regional Sunset of FPL 2012 Q4 2032

Global Sunset of FPL 2012 Q4 2034



FF-ICE Capabilities

FF-ICE Services

Planning Service (Optional)

- Preliminary Flight Plan Message
- Flight Plan Update Message
- Flight Cancellation Message
- Submission Response Message
- Planning Status Message

Filing Service (Mandatory)

- Filed Flight Plan Message
- Flight Plan Update Message
- Flight Cancellation Message
- Submission Response Message
- Filing Status Message

Trial Service (Optional)

- Trial Request Message
- Submission Response Message
- Trial Response Message

Flight Data Request (Mandatory)

- Flight Data Request Message
- Submission Response Message
- Flight Data Response Message

Publication Service (Optional)

No specific messages defined. Information on flights that match a set of criteria are transmitted to registered subscribers in response to certain events or conditions. An eASP will indicate the events and/or criteria to which a subscriber can subscribe.

Notification Service (Optional)

- Flight Departure Message
- Flight Arrival Message
- Submission Response Message

NAV CANADA's FF-ICE Service Plan

As part of the FF-ICE/R1 initial implementation phase,
the following FF-ICE services are being implemented:

Filing Service

Trial Service

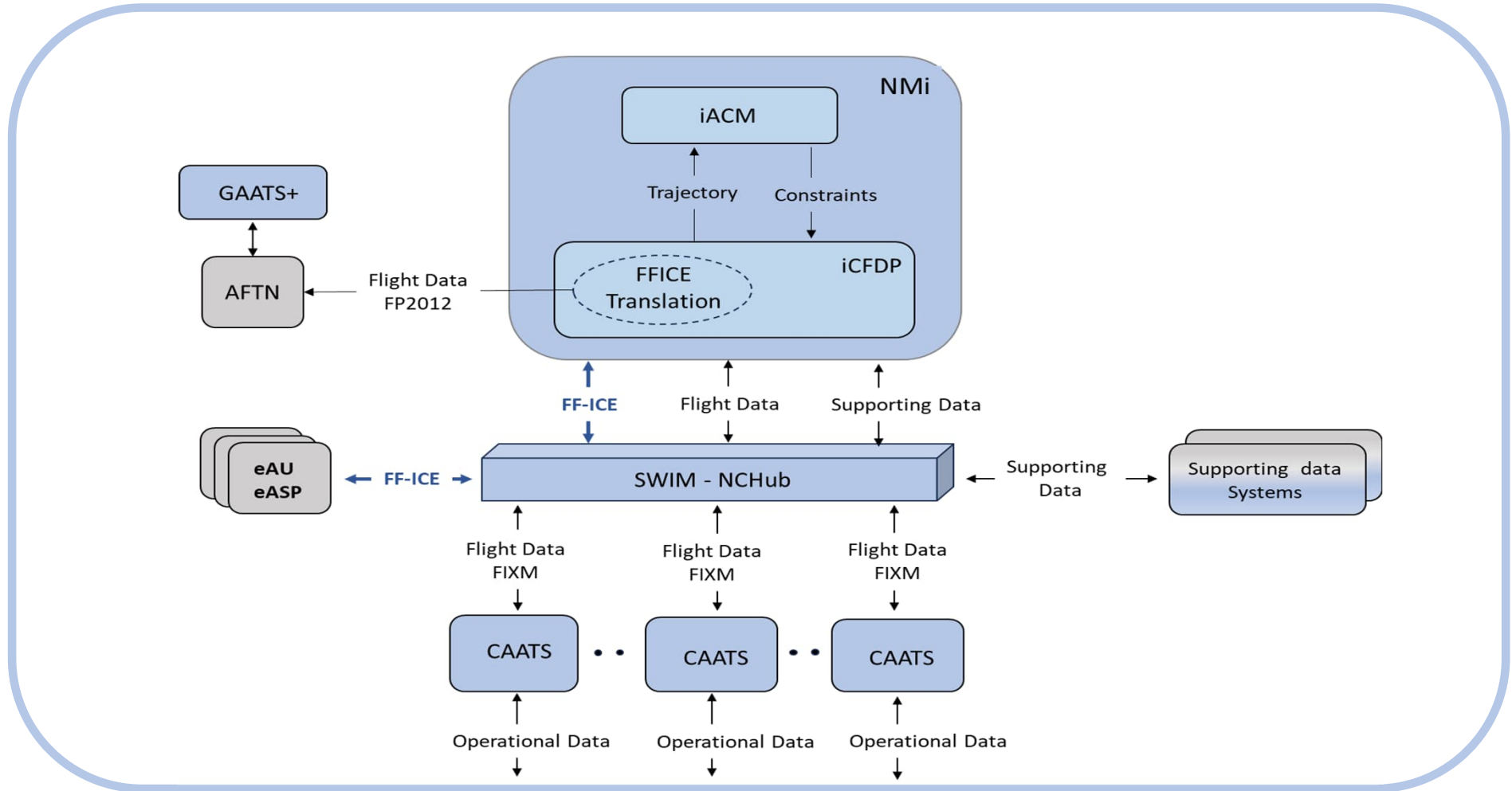
Flight Data Request

NAV CANADA's FF-ICE service implementation is based on:

FF-ICE Message v1.1.0 with Bug Fix with Core_v4.3.0

Domestic FIXM Extensions

NAV CANADA's FF-ICE - High Level System Context



Filing Service

Filing Service provides a means for FF-ICE enabled airspace users or the associated flight planning organizations to file a flight plan pertaining to Canadian airspace.

Filing Service supports the following FF-ICE message exchanges:

File New Flight Plan (eFPL)

Filed Flight Plan message published by eAU

Update Flight Plan

Update message published by eAU

Cancel Flight Plan

Flight Cancellation message published by eAU

Provide Message Submission Status

Submission Response message published by NMI

Provide Status of Filed/Updated Flight Plan

Filing Status message published by NMI

Trial Service

Trial Service provides a means for FF-ICE enabled airspace users or associated flight planning organizations to confirm the validity and acceptability of a tentative flight plan or a flight plan update, pertaining to Canadian airspace, without creating/updating an actual flight plan.

Trial Service supports the following FF-ICE message exchange:

Request Flight Plan Trial

Trial Request message published by eAU

Provide Message Submission Status

Submission Response message published by NMI

Provide Status of Trial (tentative) Flight Plan

Trial Response message published by NMI

Flight Data Request Service

Flight Data Request Service provides a means to obtain information on an FF-ICE flight plan that was filed with NAV CANADA NMI. It exercises rules on which FF-ICE participants are allowed to receive which information on specific flights. This service is targeted both for eAUs and eASPs, as applicable.

Flight Data Request Service supports the following message exchange:

Request Flight Data for a Specific Data Category

(Flight data, Supplementary data, or Filing status)

Flight Data Request message published by eAU

Provide Message Submission Status

Submission Response message published by NMI

Provide Requested Flight Data

Flight Data Response message published by NMI

Evaluation Process



Validation and Evaluation Process

Validation

Syntactical / Semantical checks of received messages result in **Submission Response** msg sent to eAU:

REJ – No further processing, message is rejected.

ACK – Message is successfully processed; flight plan and R/T is further evaluated.

NOTE: Manual (MAN) option is not supported.

Trajectory Evaluation

For operational acceptability results in **Filing Status** or **Trial Response** msg sent to eAU:

ACCEPTABLE – Agreed R/T, consistent with the desired R/T, is on record with eASP

ACCEPTABLE with ATC CHANGE – eASP requires changes to the desired R/T, mandated by ATFM

NOT ACCEPTABLE – R/T is not operationally acceptable; eAU must re-file.

CONCUR or NOT CONCUR – (For Trial service) No negotiating R/T returned.

Re-Evaluation Process

Triggered by a change in constraints affecting trajectory on record with eASP, resulting in **Filing Status** message sent to eAU if different than previously reported status.

Validation Process – Syntax and Semantics Checks

Mandatory Data Elements

at the communication protocol level checked for presence, including message originator, UUID, message type. If message originator and/or UUID not present, msg rejected, and no Submission response provided.

Authorization Validation

based on msg originator. Includes examples such as checks if the originator is the adapted FFICE participant; checks for the flight plan update and cancellation, if the originator matches the filed flight plan originator.

Message Syntax

is fully validated against the message XSDs with extensions. This includes presence of mandatory FFICE message fields and compliance to the limits imposed on the default, [0..2000] FIXM arrays.

Message Semantic Validation

based on GUF1 and key fields. Examples: Filed FPL if GUF1 is not found, key fields verified for potential match, before this check passes. Or, flight update/cancellation, key fields also part of validating for the matching flight plan. For Trial Request with GUF1 provided, it is not mandated that the flight exist at NMI.

Message Semantic Validation

based on ICAO rules (PANS-ATM ICAO Document 4444)

Operator Flight Plan Version Validation

to ensure correct increment for updates. Includes the case where Filed FPL received and matching FPL is found - if version is higher than the existing version, message will be accepted, and flight plan is overwritten.

Flight Plan Update and Flight Cancellation

are validated against the flight plan state – to ensure only pre-departure flights are modified.

Desired R/T Data Elements

result in a successfully created trajectory based on the airspace configuration.

Validation Process – Submission Response ERROR Reporting

With Submission Response REJ:

Explanation data element (one or more instances) is populated with the encountered ERRORS in this format:

For Global Errors:

“GLOBAL_ERROR: ” <<adapted text>>

e.g. “GLOBAL_ERROR: FPL_DOES_NOT_EXIST”

For Errors Associated to a Data Element:

<<Field Identity>> “[<<Value of the Field>>]: “ <<adapted text>>

e.g. “AIRCRAFT_TYPE [A32F]: UNKNOWN_AIRCRAFT_TYPE”

Evaluation Process

eAU Desired R/T is evaluated against:

RESTRICTIONS

- Mandatory IFR Routes
- NAT track amendments
- Denied flight list

FLIGHT CONSTRAINTS

- Represented in NMI as Flow Constrained Areas (FCA)
- Including constraints: SUA, ALTRV, NOTAM, SIGMET and ATFM based FCAs.
- Detailed constraints list provided in Appendix

ATFM MEASURES

- Applied by Flow Management specialist to mitigate constraints (mainly ATFM FCAs)
- Typical measures: Departure/Arrival Regulation; Re-routing; Level Capping

Evaluation Process – Filing Status Feedback

STATUS

ACCEPTABLE or NOT ACCEPTABLE

- Status value is adaptable per different types of restrictions and constraints
- e.g. NOT ACCEPTABLE for non-compliance to Mandatory IFR Routes; NOT ACCEPTABLE for SUA crossing without authorization; ACCEPTABLE for SIGMET crossing.

EXPLANATION

ADAPTED EXPLANATION TEXT for each encountered NOT ACCEPTABLE Restriction and/or Constraint

- e.g. Flight is not compliant with active NAT Tracks; crossing SUA

FLIGHT CONSTRAINT

<<XSDcomplexType>>
FlightConstraint

- + applicability: CharacterString [0..1]
- + extension: FlightConstraintExtension [0..2000]
- + impact: CharacterString [0..1]
- + restrictionReference: RestrictionReference [0..1]

+flightConstraint

←
0..2000

APPLICABILITY description

IMPACT description

RESTRICTION REFERENCE to published Advisory,
NOTAM or SIGMET, if available:

- **restrictionType** <e.g. Advisory>
- **restrictionIdentifier** <e.g. ADVZY001>
- **href** <url >

Evaluation process – Filing Status Feedback (cont'd)

AGREED R/T

eASP Modified R/T provided if ATFM measures are applied, resulting in ACCEPTABLE - ATC CHANGE response.

Includes R/T elements modifications and constraints such as:
CTOT constraint, RTO/RTA constraint, modified route, Level Cap constraint

(No R/T is provided with Trial Response)

R/T PURPOSE

None or **ATC CHANGE**

How User Makes Use of the Constraints Feedback

As Indicated on the Previous Slides: As part of the Filing status, eAU receives list of encountered Constraints.

For Each Constraint: Applicability, Impact and Restriction Reference (if available) are provided.

Restriction Reference is Typically: Advisory, but also NOTAM or SIGMET can be provided.

As such, user may examine the impact by:

- a) Look up Advisory at OIS based on Advisory_ID.
- b) User can request Advisory through iACM API (external API)
- c) Subscribe to NMI Advisory feed to consume the advisories
- d) Makes use of Applicability and Impact fields in lieu of the actual advisory

eASP feedback – consideration by eAU

eASP feedback	eAU consideration
SUBMISSION RESPONSE	
<ul style="list-style-type: none"> ACK 	Message is successfully processed
<ul style="list-style-type: none"> REJ 	Errors are encountered and message is rejected; eAU must correct errors and re-submit the message
FILING STATUS	
<ul style="list-style-type: none"> ACCEPTABLE 	eAU should take note of constraints, if any; Agreed R/T is on record with eASP and is consistent with the Desired R/T
<ul style="list-style-type: none"> ACCEPTABLE – ATC CHANGE with R/T 	eAU needs to update the FPL to comply with ATC required changes based on the modified R/T. Or file different R/T for evaluation.
<ul style="list-style-type: none"> NOT ACCEPTABLE 	R/T is not operationally acceptable; eAU must file an updated FPL, based on the provided feedback
TRIAL RESPONSE	
<ul style="list-style-type: none"> CONCUR 	eAU should take note of indicated constraints, if any.
<ul style="list-style-type: none"> NON-CONCUR 	eAU should take note of the indicated constraints, and modify R/T before filing or updating the flight plan

FIXM Format Observations



Domestic Extensions

Following FIXM data Elements Extension hooks are utilized to include Canadian extensions:

Aircraft Support of selection of aircraft landing gear type

AerodromeReference Support of alphanumeric aerodrome reference

Flight Support of Canadian type of flight

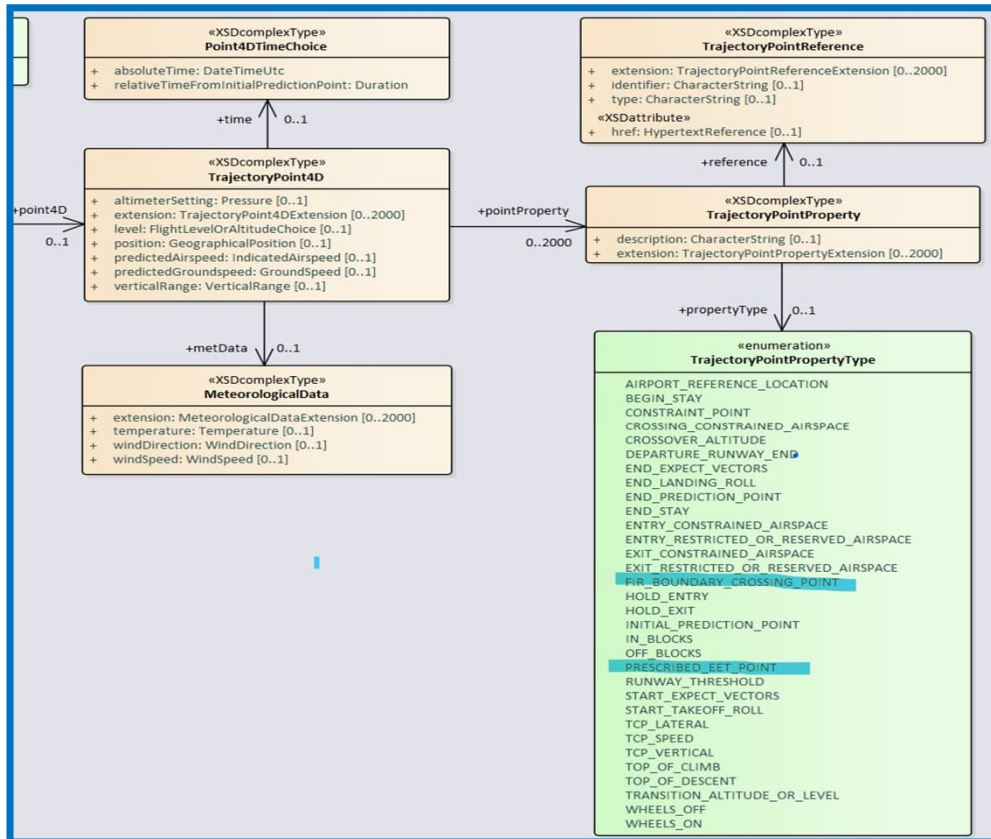
FlightRouteInformation Support of SAR EET as part of route information

SupplementaryInformation Support of additional supplementary data

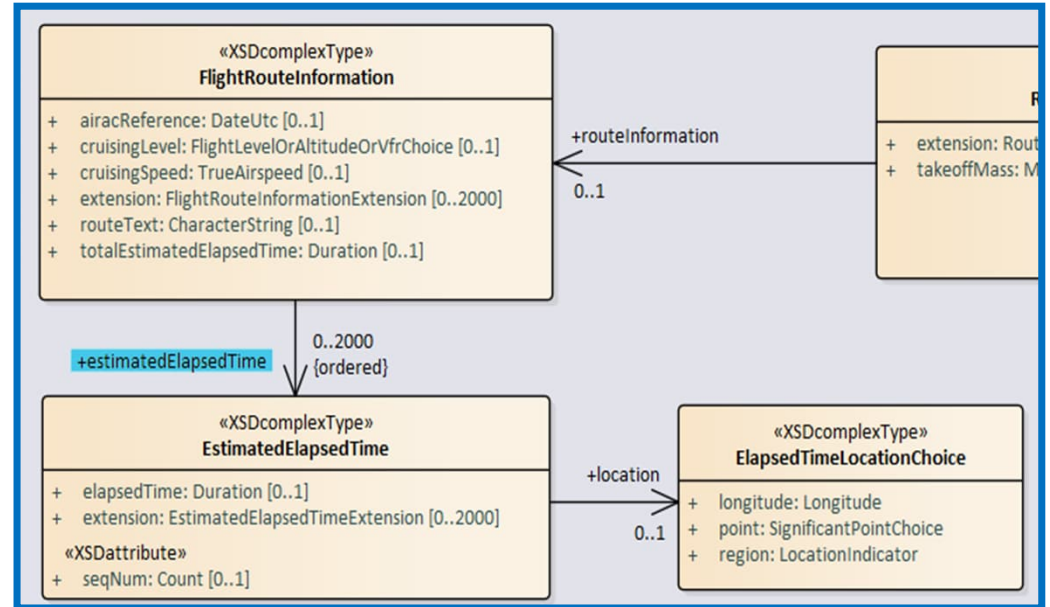
SurvivalCapabilities Support of additional survival equipment

Handling of “Field 18 EET”

FIXM CORE Supports EET as part of R/T



FIXM CORE Also Supports EET as part of Route Information



FFICE However Restricts EET as part of Route Information

- EC NM introduces an extension to remove this restriction
- NAV CANADA follows the FFICE guideline and expects EET to be filed as part of R/T
- There should be unified approach to handling boundary EETs

Significant Points Choices – Relative Points

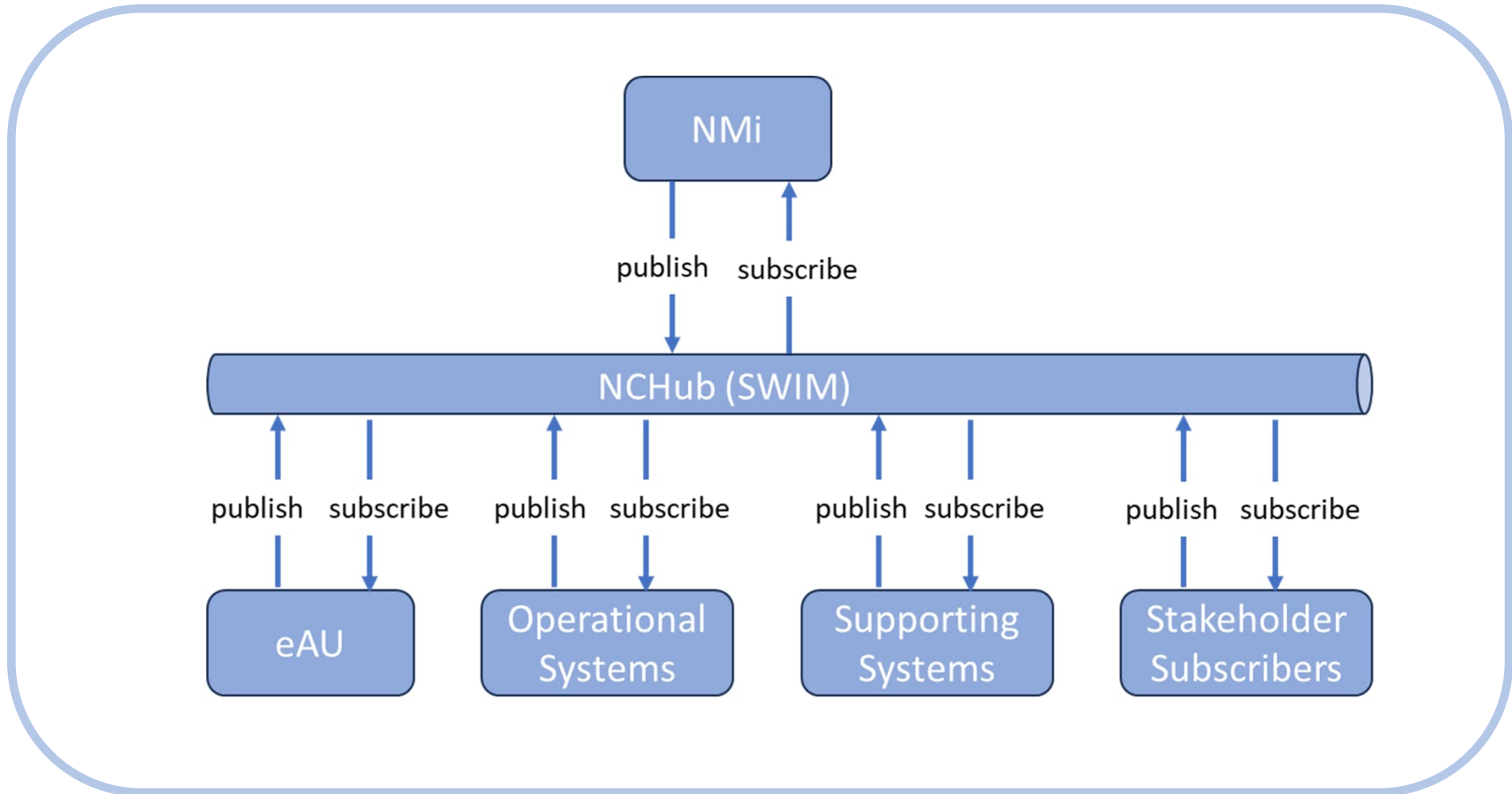
- **As of FIXM 4.2:** There is no longer support for expressing Significant Point as a Relative Point (Range & Bearing) against a waypoint. Only NAVAIDS are supported as a reference point.
- Traditionally, this restriction made sense.
- **However:** We now have operational examples, where, as a result of ground-based systems calculating boundary crossings based off adapted fixes/waypoints (or manual user intervention to represent approximate routing to support automation), this significant point type is utilized.
- **As such:** Our internal FIXM messaging is running into this restriction. We cannot successfully communicate R/T, boundary estimates and other entities where such significant point type can be encountered.
- If not resolved natively in FIXM, this would require number of elements to be extended using “proprietary” extensions. This is not desirable.

```
(CPLPAZA/CZEG221-ASA223/A6615-IS<CR><LF>-B739-SWRGIDE3FJ4J7P2Z/LB1D1<CR><LF>-KSEA-
BAVKE298024/0818F340<CR><LF>-N0452F340 4824N12320W BAVKE298024 DCT RDFLG
HRDNG4<CR><LF>-PAFA<CR><LF>-PBN/A1C1D1L1S2T1 NAV/RNVD1A1E2<CR><LF> DAT/1FANSE2PDC
SUR/260B RSP180 CANMANDATE REG/N272AK<CR><LF> EET/PAZA0115 CZEG0154 PAZA0221 SEL/JSFL
CODE/A2ADF4 PER/C<CR><LF> RMK/ADSB TCAS EQUIPPED)
```

Connectivity Architecture



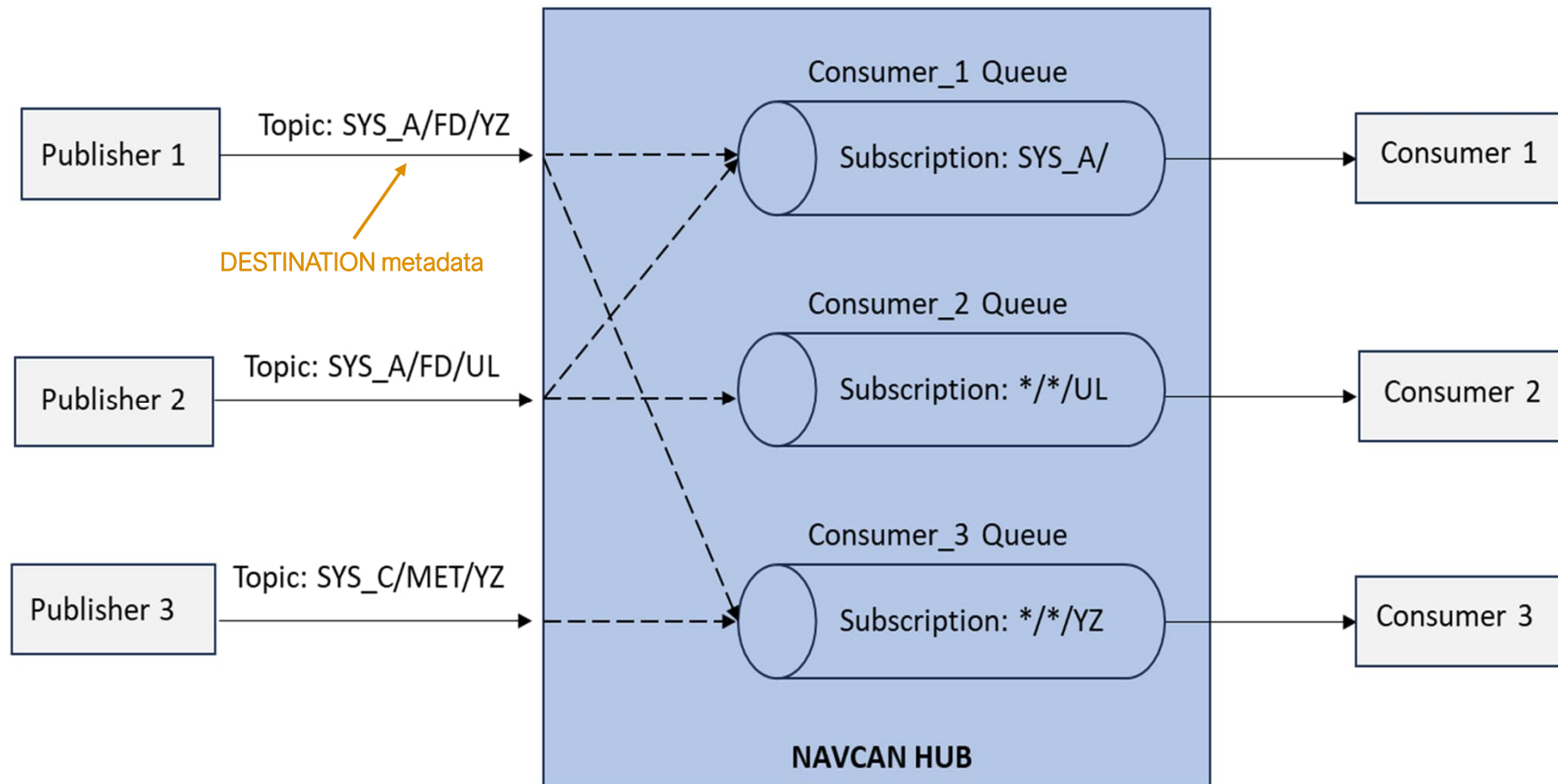
Publish/subscribe model via NAV CANADA HUB (SWIM)



NAV CANADA HUB - Publish/Subscribe Architecture

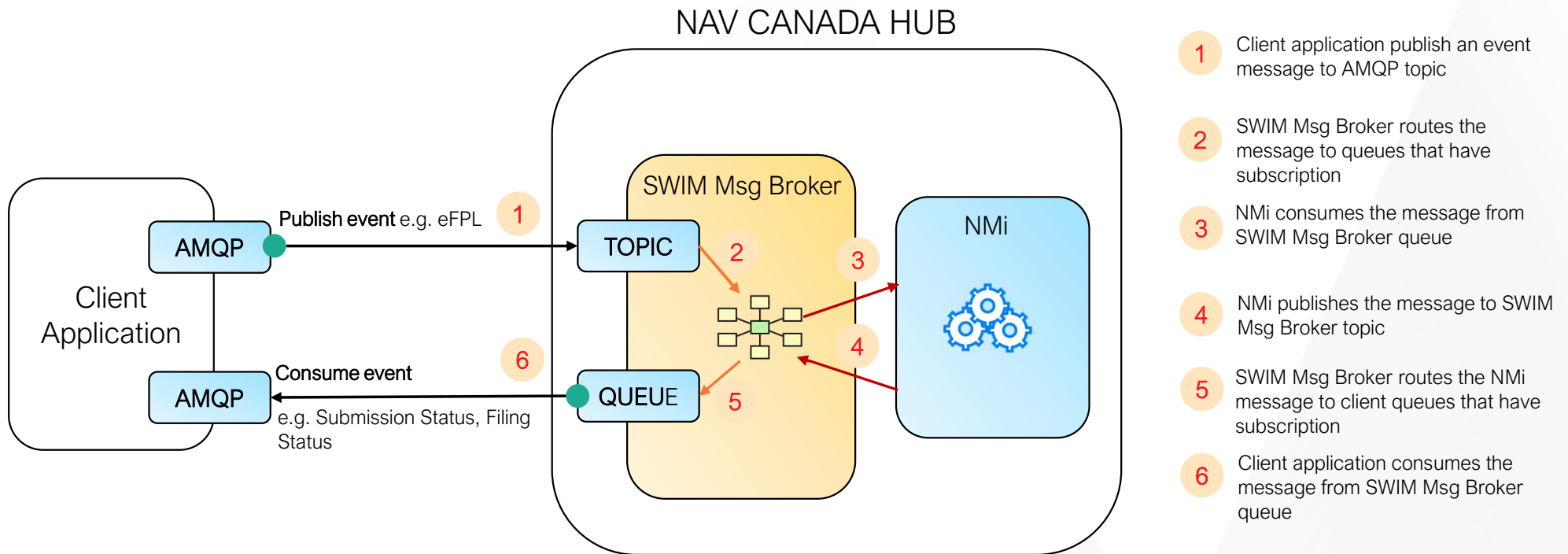
- **NAV CANADA's SWIM Implementation:** is realized through its **NAVCANHub** component.
- **NAVCANHub Core Components:** are message brokers (iBus) that use publish/subscribe architecture.
- **Two Key Concepts:** Topics and Queues.
- **NAVCANHub Requires:** its clients to use the AMQP 1.0 protocol for communication (there are various openly available AMQP1.0 libraries which can be used).
- **AMQP Application Properties:** are utilized to exchange some of the FFICE message data elements (originator, UUID, timestamp, message type), at the communication layer instead of the FFICE payload.

NCHub – Topics and QUEUES



NAV CANADA B2B PUB/SUB MESSAGE PATTERN

Publish and Subscribe/Consume



FFICE PUBLISHER - AMQP MESSAGE TOPIC DEFINITION

		Field Name	Value
AMQP Metadata	NCHub Header	DESTINATION_TYPE	TOPIC
		DESTINATION	<FFICE/Source/SourceSite/SourceEnvironment/MessageVersion/Service/MessageType/Recipient>
		MSG_ORIGINATOR	<unique FFICE participant>
	Application Properties	MSG_UUID	<unique message identifier>
		MSG_PUBLISH_TIME	<timestamp>
		MSG_VERSION	<AMQP message version>
		MSG_TYPE	<ffice message type>
		MSG_RECIPIENT	NMI
	Payload		<FFICE message Payload>

AMQP Application properties are utilized to communicate FFICE message properties such as originator, UUID etc.

EXAMPLE: AIR CANADA PUBLISHES Filed Flight Plan

1) FFICE Filed Flight Plan Message published by AIR CANADA eAU to NCHub

		Field Name	Value
Metadata	NCHub Header	DESTINATION_TYPE	TOPIC
		DESTINATION	FFICE/AIRCANADA/CYYZACAW/CERT/V1/FILING/FILED_FLIGHT_PLAN/NMI
		MSG_ORIGINATOR	ACAAOCC
	Application Properties	MSG_UUID	48b47be0-bedf-41f9-96aa-94e62d1de7bd48b47be0-bedf-41f9-96aa-94e62d1de7bd
		MSG_PUBLISH_TIME	2025-07-26 19:26:33 624
		MSG_VERSION	V1
		MSG_TYPE	FILED_FLIGHT_PLAN
		MSG_RECIPIENT	NMI
	Payload		FFICE message Payload

NCHub uses DESTINATION to route a TOPIC to the right QUEUE

2) FFICE Message is received in NMI queue on NCHub

Queue Name	Queue subscription
NMI_EAU-FFICE-V1	FFICE/**/CERT/V1/**/NMI/>
DEFINITION: <QueueOwner>_<SourceSystem>-<DataType>-<MessageVersion>	

EXAMPLE: AIR CANADA CONSUMES Submission Response

1) FFICE Submission Response message is published by NMI to AIR CANADA eAU

		Field Name	Value
Metadata	NCHub Header	DESTINATION_TYPE	TOPIC
		DESTINATION	NMI/TSC/CERT/V1/FFICE/FILING/SUBMISSION_RESPONSE/ACAAOCC/
		MSG_ORIGINATOR	NMI
	Application Properties	MSG_UUID	59b47be0-bedf-41f9-96aa-94e62d1de7bd48b47be0-bedf-41f9-96aa-94e62d1de7bd
		MSG_PUBLISH_TIME	2025-07-26 19:26:33 624
		MSG_VERSION	V1
		MSG_TYPE	SUBMISSION_RESPONSE
		MSG_RECIPIENT	ACAAOCC
Payload		FFICE message Payload	

NCHub uses DESTINATION to route a TOPIC to the right QUEUE

2) FFICE Message received in AIR CANADA eAU queue on NCHub

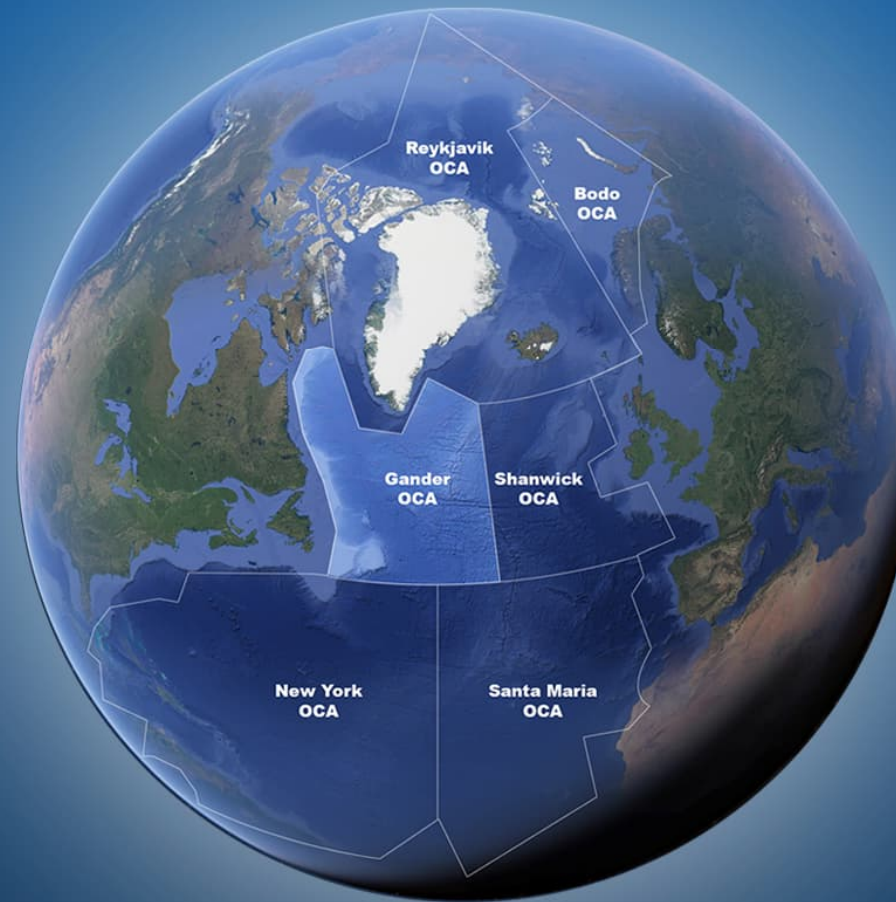
Queue Name	Queue subscription
ACA_NMI-FFICE-V1	NMI*/CERT/V1/FFICE*/*/ACAAOCC/>
DEFINITION: <QueueOwner>_<SourceSystem>-<DataType>-<MessageVersion>	or NMI*/CERT/V1/FFICE*/*/ACA*/>

Key Message

Based on previous slides the following are the key takeaways:

Proliferation of extensions
Opportunity for feedback standardization
Multiple implementations of data fields
Multiple message exchange patterns
Stakeholder Engagement

North Atlantic (NAT) FF-ICE Impact



North Atlantic (NAT) FF-ICE Impact

Implementation Status:

- FF-ICE integration under beginning stages of development planning.
- GAATS+ not within scope of current centralized Canadian iTEC FDP development.
- FIXM support not available/required for R1/R2.
- Central FDP will translate FF-ICE FPLs to FP2012 and transmit to oceanic GAATS+ FDP.

Operational Impact:

Strategic Focus, Not Tactical:

- ATCO role remains largely unchanged in R1/R2
- CNMU trajectory modeler builds flight paths
- Airspace users do not directly control FDP trajectories
- In NAT airspace, climb and descent rates aren't prohibitive (currently employing 3-degree reach by restrictions).
- Trajectory calculations are already very accurate within Canadian FDPs. ATFM is potentially where most strategic value exists.

FF-ICE R1/R2 enables strategic negotiation without
Fundamentally changing NAV CANADA's NAT operations.

NAT FF-ICE Use Case for Strategic Optimization

RCL Removal

Today:

Canada receives eastbound RCL messages 60-90 minutes prior to OEP communicating aircraft OEP, time, Mach, and preferred/max level.

Problem:

Without the RCL, ATC is reliant on FPLs received 12-16 hours prior, which often no longer represent an aircraft's desired profile.

Solution:

Within an FF-ICE environment, airspace users may submit optimized trajectories to the CNMU to update previously filed flight plans. If the CNMU is able to accept, the new submission will become the new agreed to trajectory.

Benefits:

Strategic optimization.
Elimination of currently observed RCL confusion.

NAT FF-ICE Use Cases for Strategic Optimization

3 Further Use Case Examples

OTS Loadings

Today:

ATC assesses flight level/route loadings for sectorization decisions.

With FF-ICE:

Calculate demand vs. capacity, provide feedback to users and upstream ANSPs.

Benefits:

- Strategic optimization
- Enhanced coordination
- No FDP/ATCO role changes

Flow Constraints

Scenario:

Oceanic constraint requires ATFM measures.

Process:

1. CNMU creates constraint area
2. AOC negotiates re-optimized trajectory with CNMU
3. Solutions may include trajectory adjustment, delayed departure.

Implementation:

ATCO actions remain unchanged; R2 negotiations occur pre-departure.

GEESE Pairings

Capability:

Systems provide advance notice of flights over points within timeframes.

CNMU Function:

- Identify eligible flight pairings
- Provide feedback to airspace users
- Facilitate GEESE operations in NAT

Tool Type:

- Primarily CNMU strategic planning tool.

North Atlantic (NAT) FF-ICE Use Cases

In each of these cases, FF-ICE SERVICES would be utilized to support:

1. Notification to users for pre-departure flights via re-evaluation process,
2. Publication to ATCO to support airborne implementation (early R2 process),
3. Publication to downstream users (i.e. EC NM).



NAV
CANADA

A white graphic element consisting of a horizontal line that tapers at both ends, forming a wide, shallow 'V' or arrow-like shape pointing upwards.

Thank you

APPENDIX A - Constraint Categories

Constraint Categories

Constraint Type	Reference
AIRSPACE	
CYD – Danger Area	Adapted SUA
CYR – Restricted Area	Adapted SUA
CYA – Alert Area	Adapted SUA
MOA – Military Operation	Adapted SUA
TFR - Forest Fire Aircraft Operating Restriction	NOTAM
TFR - Restricted by Minister	NOTAM
TFR - Restricted by Transport Canada authorized Delegate	NOTAM
Altitude Reservation	ALTRV
FLIGHT PLANNING	
Mandatory IFR Routes	Adapted Routes
ATFM	
FCA zero capacity	Advisory (incl FCA_ID)
FCA non-zero capacity	Advisory (incl FCA_ID)

Constraint Categories

Constraint Type	Reference
NAVIGATION RESOURCE	
ATS Routes not authorized	NOTAM
NAVAID out of service	NOTAM
ILS unserviceable	NOTAM
ILS out of service	NOTAM
GPS out of service/degraded	NOTAM
RVR sensor unserviceable	NOTAM
SURVEILLANCE RESOURCE CLASS	
Radar out of service	NOTAM
Enroute Radar unserviceable	NOTAM
Terminal Area Surveillance Radar unserviceable	NOTAM
ADSB, SBADSB, or ADSC unserviceable	NOTAM

Constraint Categories

Constraint Type	Reference
AERODROME	
Runway closure	NOTAM
Partial Runway closure	NOTAM
Runway Width reduction	NOTAM
Closed Taxiway	NOTAM
METEOROLOGICAL	
En-route	SIGMET (WS)
Volcanic Ash	SIGMET (WV)
Tropical Cyclone	SIGMET (WC)
VOLCANIC ACTIVITY	
Volcanic eruption	NOTAM
Change to previous activity	NOTAM