SWIM

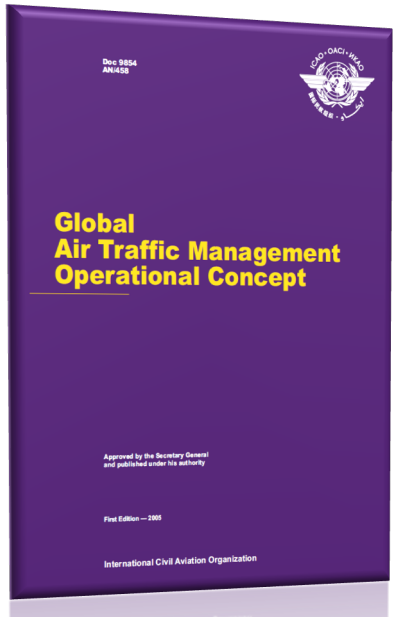
The Paradigm Shift behind Next-Generation ATM Operations

Amornrat Jirattigalachote, PhD
Expert (Director Level), AEROTHAI

ICAO APAC SWIM Training cum Workshop, 25 - 27 August 2026

ICAO Doc 9854 GATMOC

First Edition, 2005



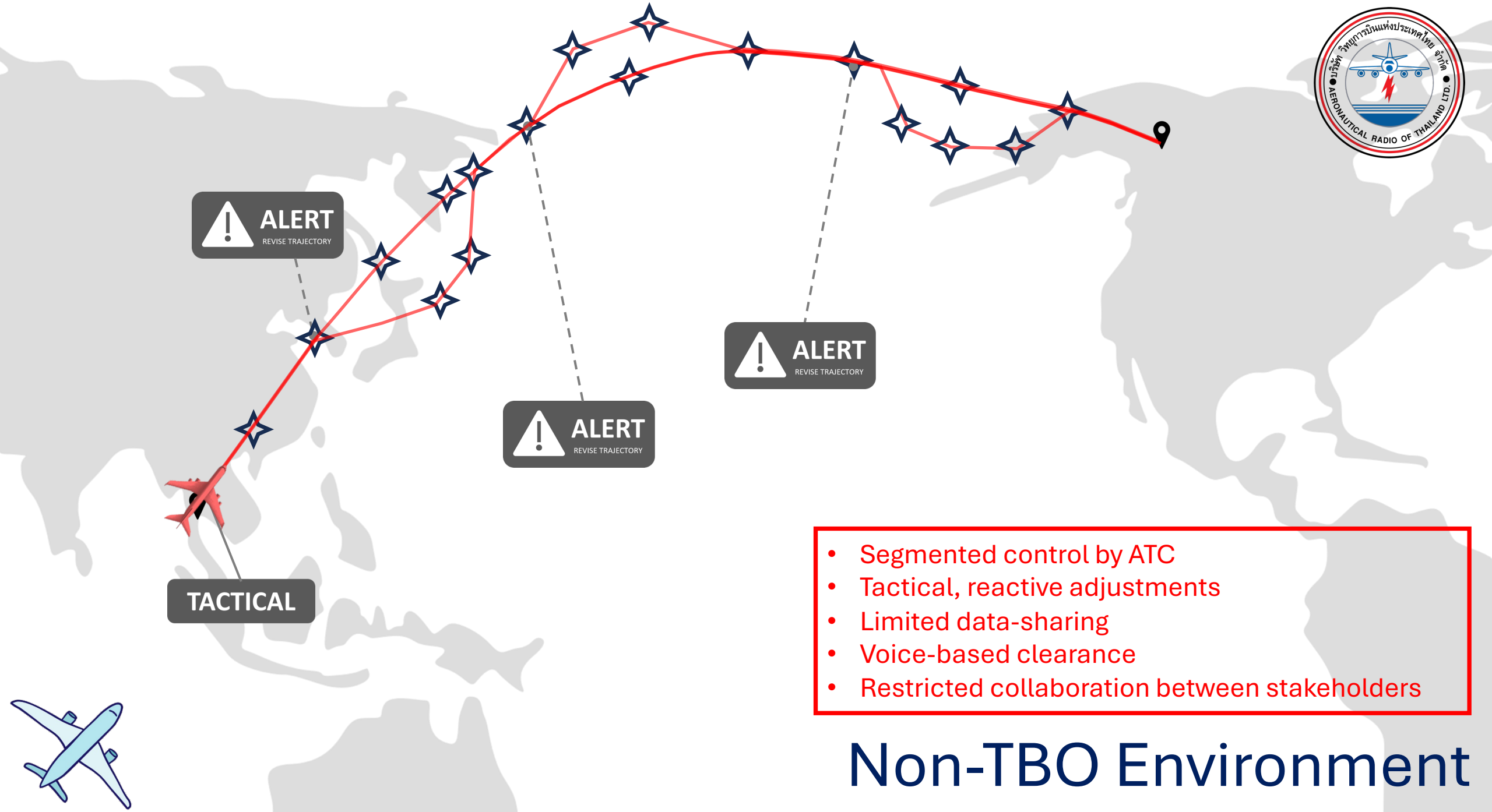
Vision

To achieve an **interoperable global air traffic management system**,
for **all users** during **all phases of flight** which meets **agreed levels** of safety,
provides for optimum economic operations, is environmentally sustainable,
and meets national security requirements

Envisioned ATM System

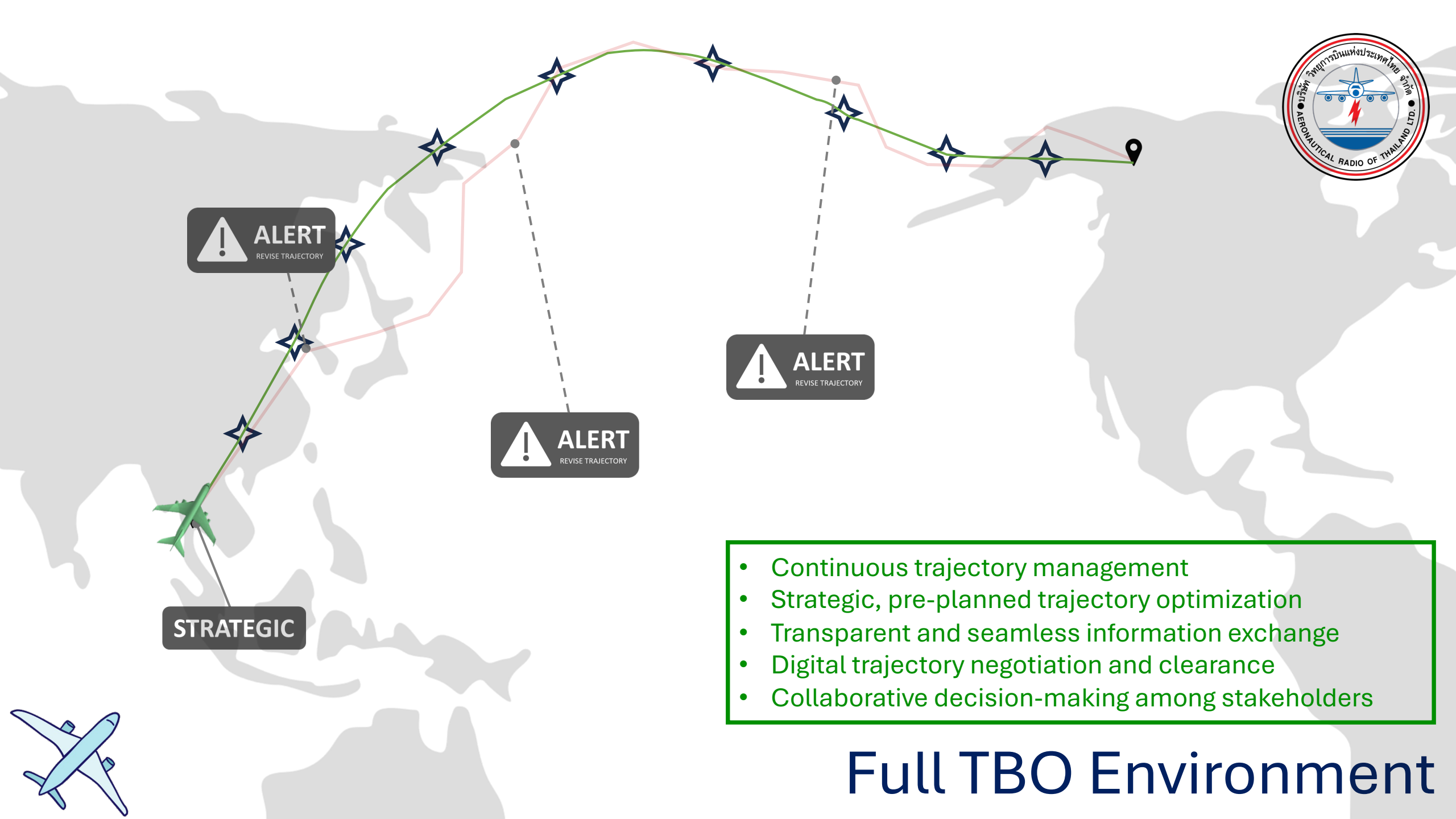
TBO

ATM considers the **trajectory** of a **manned or unmanned vehicle**
during **all phases of flight** and manages the **interaction of that trajectory with other trajectories or hazards** to achieve the optimum system outcome,
with **minimal deviation from the user-requested flight trajectory**,
whenever possible



- Segmented control by ATC
- Tactical, reactive adjustments
- Limited data-sharing
- Voice-based clearance
- Restricted collaboration between stakeholders

Non-TBO Environment

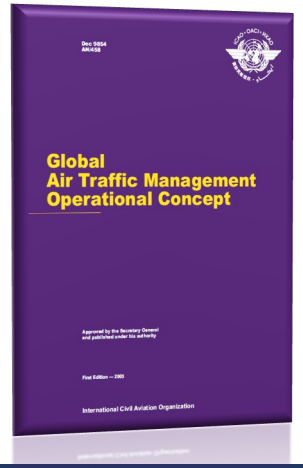


- Continuous trajectory management
- Strategic, pre-planned trajectory optimization
- Transparent and seamless information exchange
- Digital trajectory negotiation and clearance
- Collaborative decision-making among stakeholders

Full TBO Environment

ICAO Doc 9854 GATMOC

First Edition, 2005



1. Global standards
2. Uniform principles

SWIM
'glue' between GATMOC concept components

'glue' : Interoperable information exchanges within the global ATM system of systems

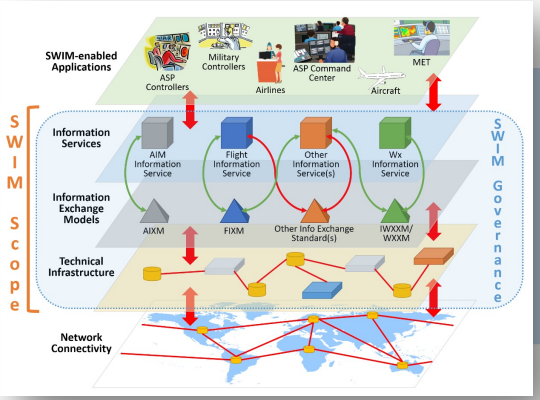
Vision

To achieve an **interoperable global air traffic management system**, for **all users** during **all phases of flight** which meets **agreed levels** of safety, provides for optimum economic operations, is environmentally sustainable, and meets national security requirements

Information Services

1. Data centric
2. Network centric

Key TBO Enablers



SWIM

- Intranet for aviation
  - → Information sharing platform among members of aviation community

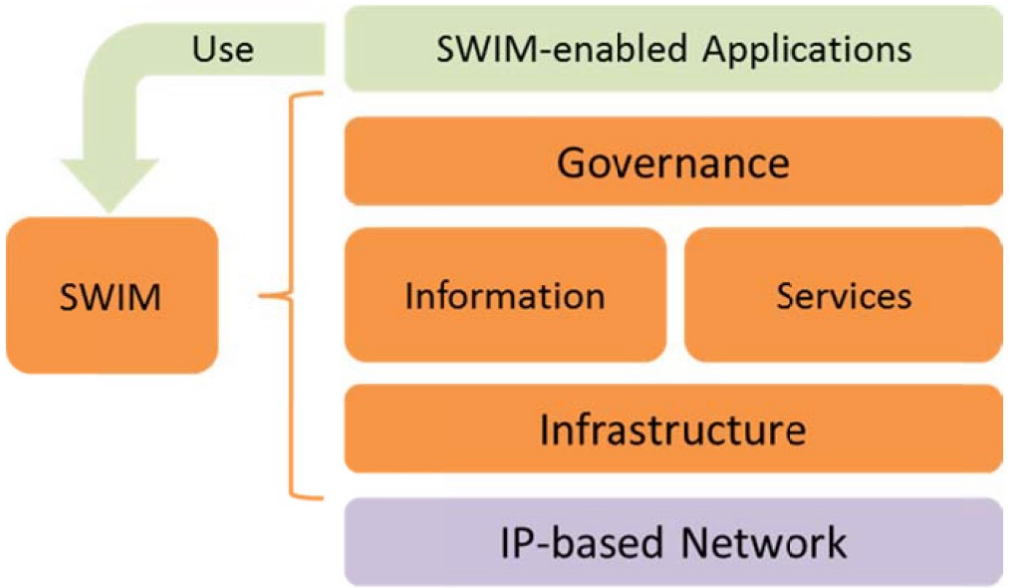
FF-ICE

- A collaborative-decision making mechanism
  - → Enabling dynamic flight trajectory exchange and management among ATM stakeholders to achieve optimum performance

Connected Aircraft

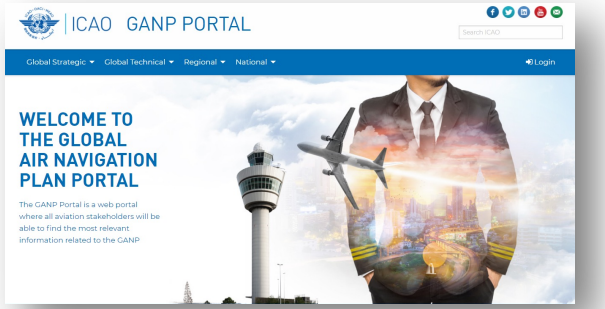
- Information exchange with flight deck
  - → Enabling digital interactions among stakeholders to support a wide range of applications to improve performance

System-Wide Information Management



- Intranet for aviation
  - → Information sharing platform among members of aviation community
- Components
  - → Information
  - → Information services
  - → Technical infrastructure
  - → (supported by) Governance
- Enable **the management and discoverability of ATM-related information** and its **exchange** between **qualified parties** via **interoperable services**

ICAO Doc 9750 Global Air Navigation Plan Conceptual Roadmap



https://ganpportal.icao.int/

Total Performance Management System Focus on Business/Mission

Fully-optimized decision making

Improved total system performance

Trajectory-Based Operations enabled by Full Connectivity through the Internet of Aviation

Everything in aviation that can be connected, is connected

Enhanced predictability, increased reliable flexibility, improved strategic planning, decreased uncertainty

Time-Based Operations enabled by an Information Revolution

Single, shared-view, coordinated system

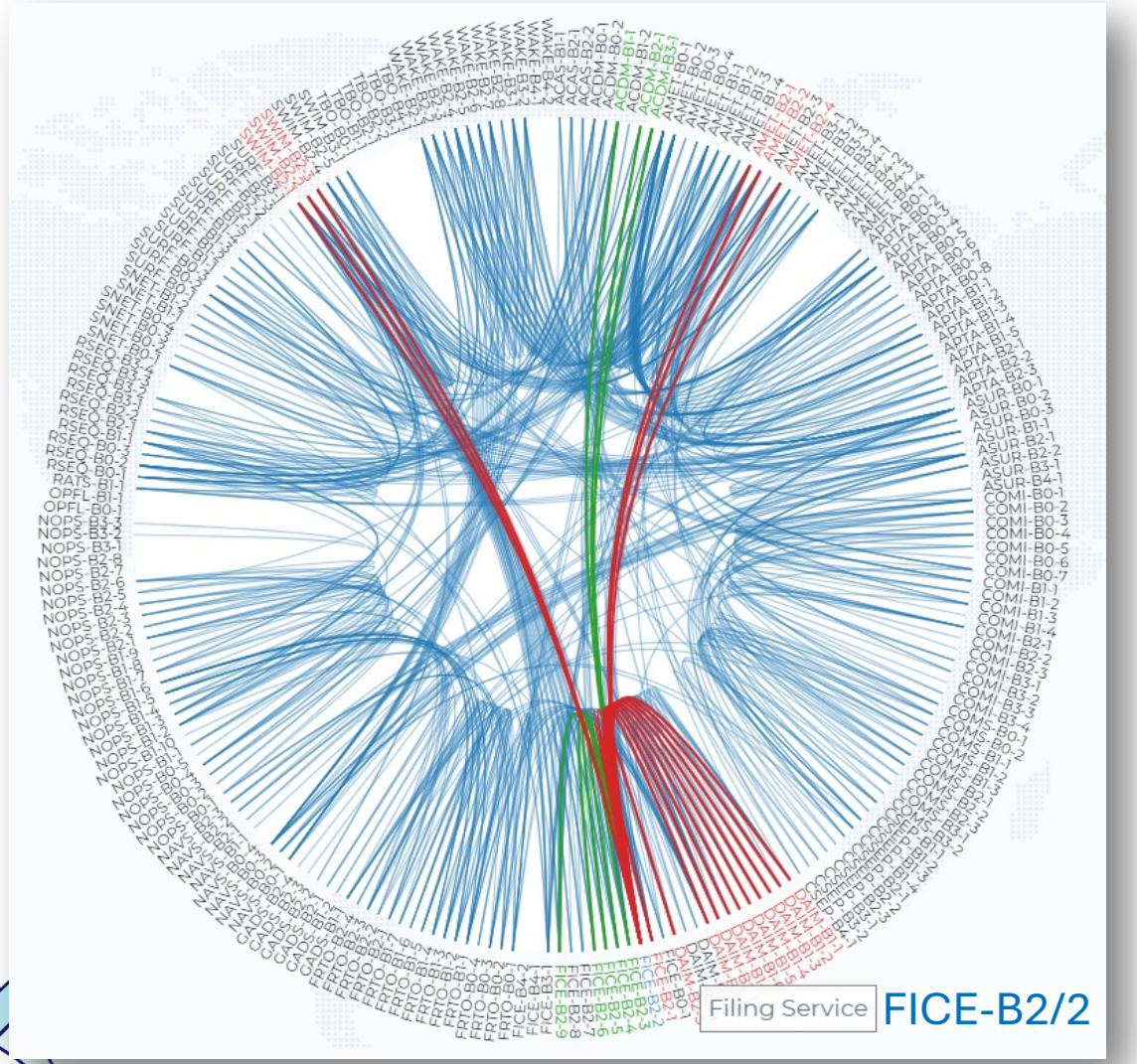
Improved efficiency, predictability, cost-effectiveness

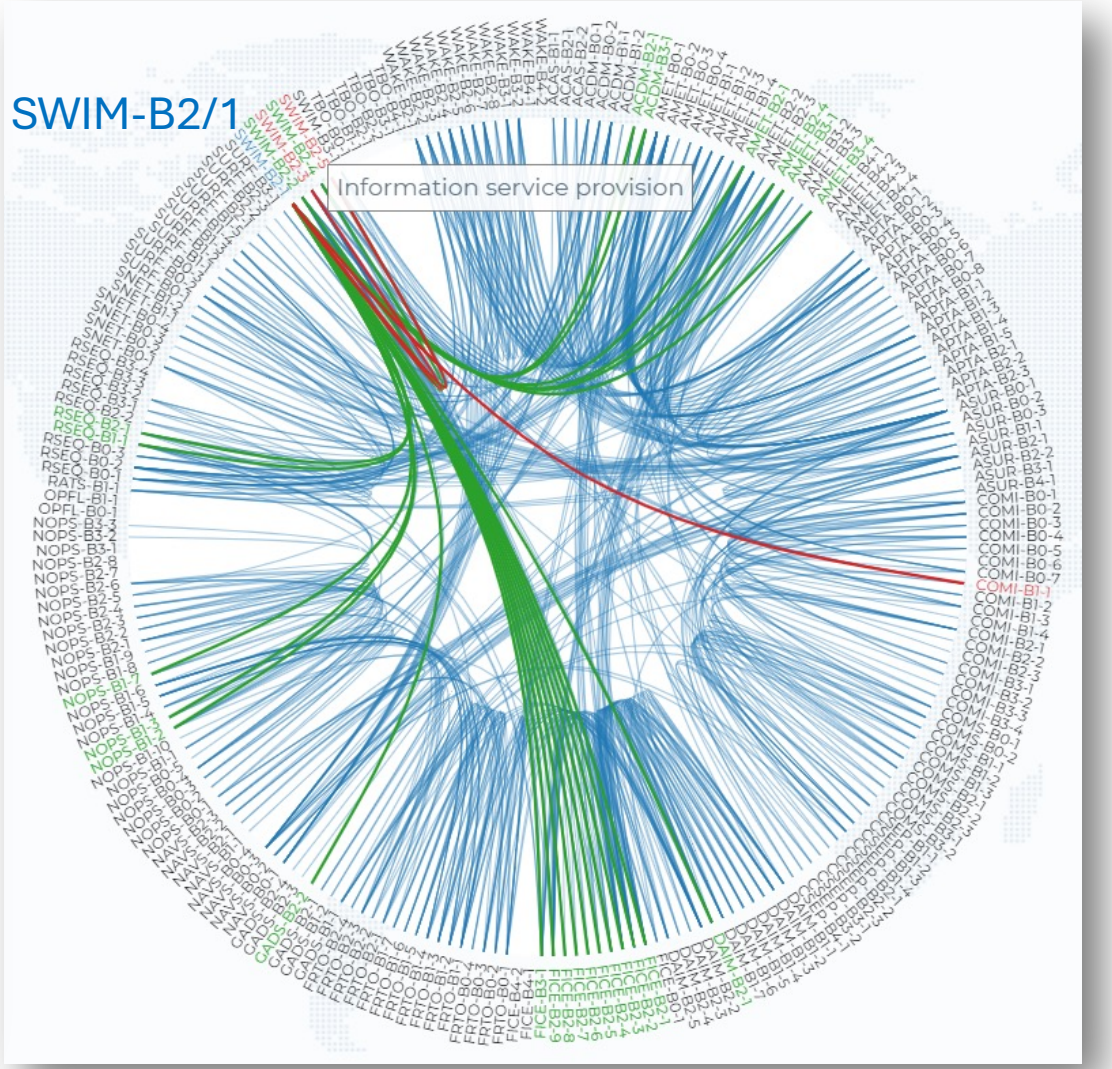
Flight Operations in a Digital Rich Environment

Volume-allocated constraints with associated time and position

Improved system's capacity

ICAO ASBU Dependency Graph





ASBU Update, GANP – 8th Edition

SWIM – Overview

SWIM

• Point-to-point connectivity and protocols • Store-and-forward information exchange • Pre-defined messages	• Aviation intranet • PUB/SUB, REQ/REP information exchange • Information discoverability • Standardized information exchange models • Interoperable information services • Governance • Ground/Ground SWIM	• Air/Ground SWIM for non-safety critical information exchange • Aircraft = Information Node	• Air/Ground SWIM for safety critical information exchange • Global SWIM governance

Time

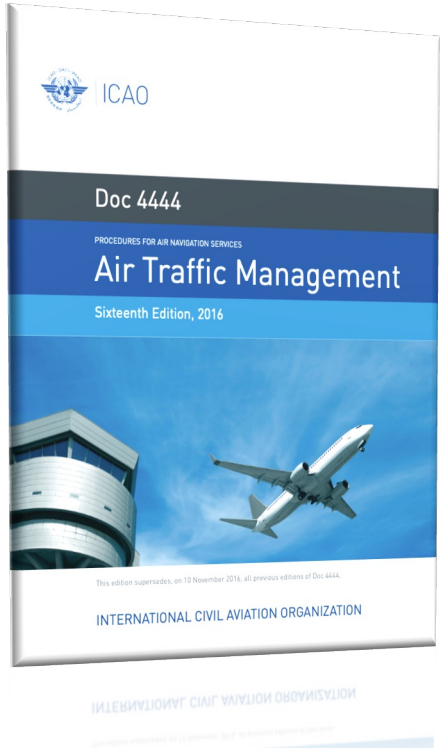
AN-CONF/14

14th Air Navigation Conference

26 August to 6 September 2024 | Montréal, Canada

Recommendation 3.2/2 – Transition to flight and flow – information for a collaborative environment services and cessation of ICAO 2012 flight plan by 2034

ICAO Doc 4444 PANS-ATM



17.5 TECHNICAL AND INTEROPERABILITY REQUIREMENTS

17.5.1 FF-ICE services shall make use of information services.

Note 1. — In the context of system-wide information management, the information service addresses machine-to-machine interaction in a service-oriented architecture.

Note 2. — Procedures on information services are contained in the Procedures for Air Navigation Services - Information Management *(PANS-IM, Doc 10199).*

28/11/24
No. 12

17.5.2 The providers and users of the FF-ICE services shall adopt an information exchange model that:

a) provides the structure and format of the required flight and flow data elements, including their properties, associations and data types, and data value constraints;

b) enables the construction and exchange of the standard FF-ICE messages in Table 17-1; and

c) provides a mechanism by which additional flight and flow data and/or FF-ICE messages can be used without affecting global interoperability.

Note. — Details on the structure and format of the flight and flow data elements and FF-ICE messages are contained in the Manual on Flight and Flow — Information for a Collaborative Environment (FF-ICE) *(Doc 9965).*

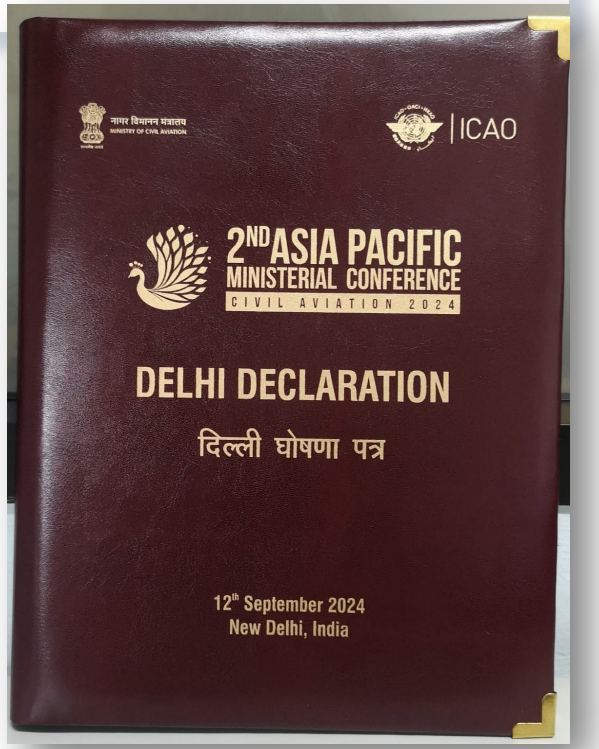
Asia/Pacific SWIM Implementation Timeline

Conclusion APANPIRG/33/9 *(CNS SG/26/06 (SWIM TF/06/02, SWIM TF/06/04))*: **The Asia-Pacific SWIM Implementation Timeframe and inclusion of the Asia/Pacific SWIM Implementation in the Asia/Pacific Seamless ANS Plan**	
What: 1. To set the timeframe for the implementation of SWIM in the Asia-Pacific region to be between 2024 and 2030, with 2030 being the target timeline for implementation completion. 2. To include SWIM implementation in the next edition of the Asia/Pacific Seamless ANS Plan.	Expected impact: ☐ Political / Global ☐ Inter-regional ☒ Economic ☐ Environmental ☒ Ops/Technical
Why: This is to set the concrete target implementation of the Asia-Pacific regional SWIM to assist States in harmonizing their implementation plans in order to achieve the seamless information exchange across the region in time for future operations, e.g. FF-ICE. Additionally, to ensure that SWIM, a key building block to achieve the vision outlined in ICAO Doc 9854 Global ATM Operational Concept (GATMOC), is captured in the Asia/Pacific Seamless ANS Plan, providing an overall framework for Asia/Pacific States to plan their implementations to meet the future performance requirements.	Follow-up: ☒ Required from States
When:	
Who: TF	

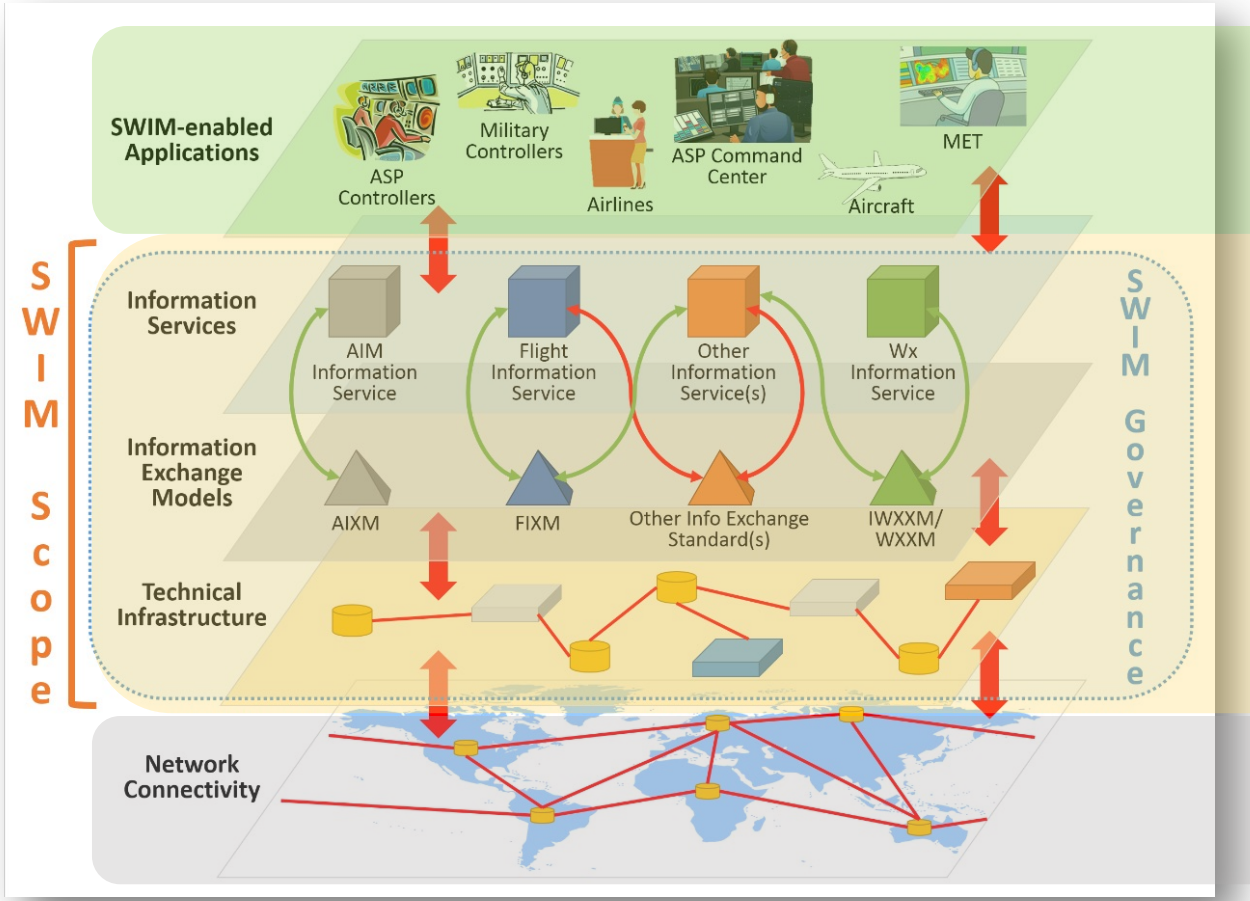
- 2024 – 2030: Implementation timeframe
- 2030: Target implementation completion

Asia/Pacific Ministerial Declaration on Civil Aviation (Delhi Declaration)

- Expediting the implementation of ICAO provisions related to SWIM



SWIM in Asia/Pacific Context

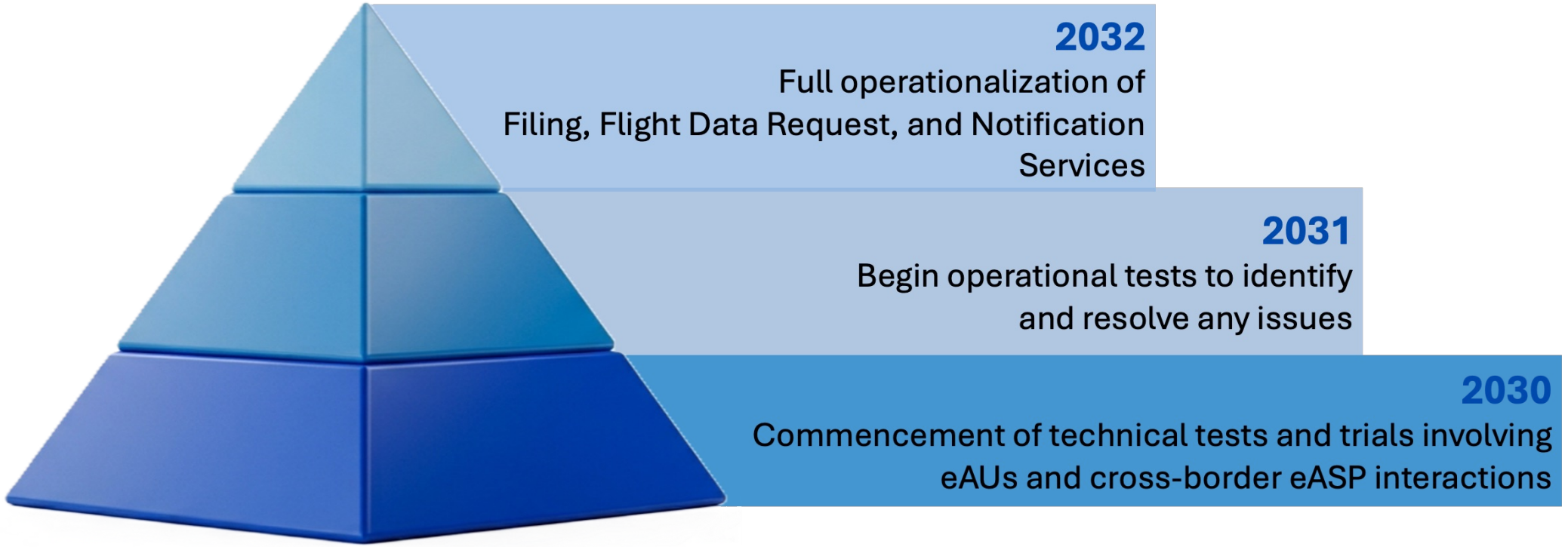


AIM, ATFM, FF-ICE, MET, SAR, etc.

SWIM

CRV (and internet)

Asia/Pacific FF-ICE/R1 Implementation Timeline

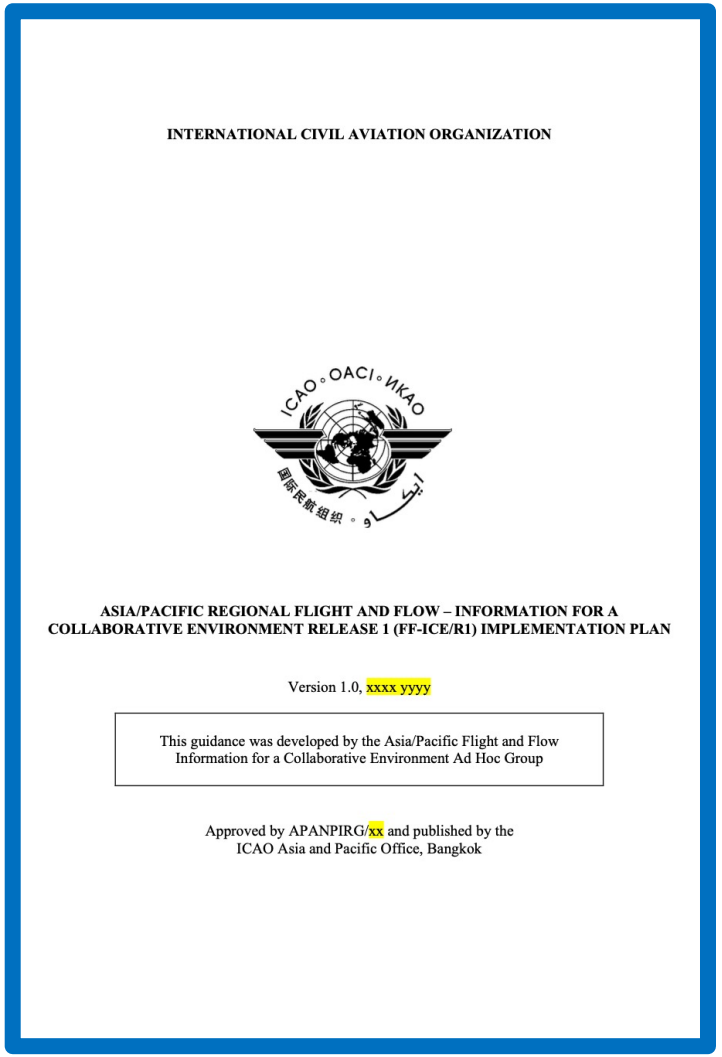


Draft Conclusion ATM/SG/14-5: Adoption of FF-ICE/R1 Implementation Timeline

APAC Regional FF-ICE/R1 Implementation Plan

Evaluation of eFPLs (FF-ICE flight plan) require checks against restrictions and constraints to ensure comprehensive evaluation of flight plan acceptability

- → Aerodrome, airspace, and route availability
- → ATFM measures
- → Environmental conditions such as aerodrome and enroute meteorological forecasts and hazards, affecting airspace availability or constraints; and
- → Aircraft operations requirements



INTERNATIONAL CIVIL AVIATION ORGANIZATION

ASIA/PACIFIC REGIONAL FLIGHT AND FLOW – INFORMATION FOR A COLLABORATIVE ENVIRONMENT RELEASE 1 (FF-ICE/R1) IMPLEMENTATION PLAN

Version 1.0, xxxx yyyy

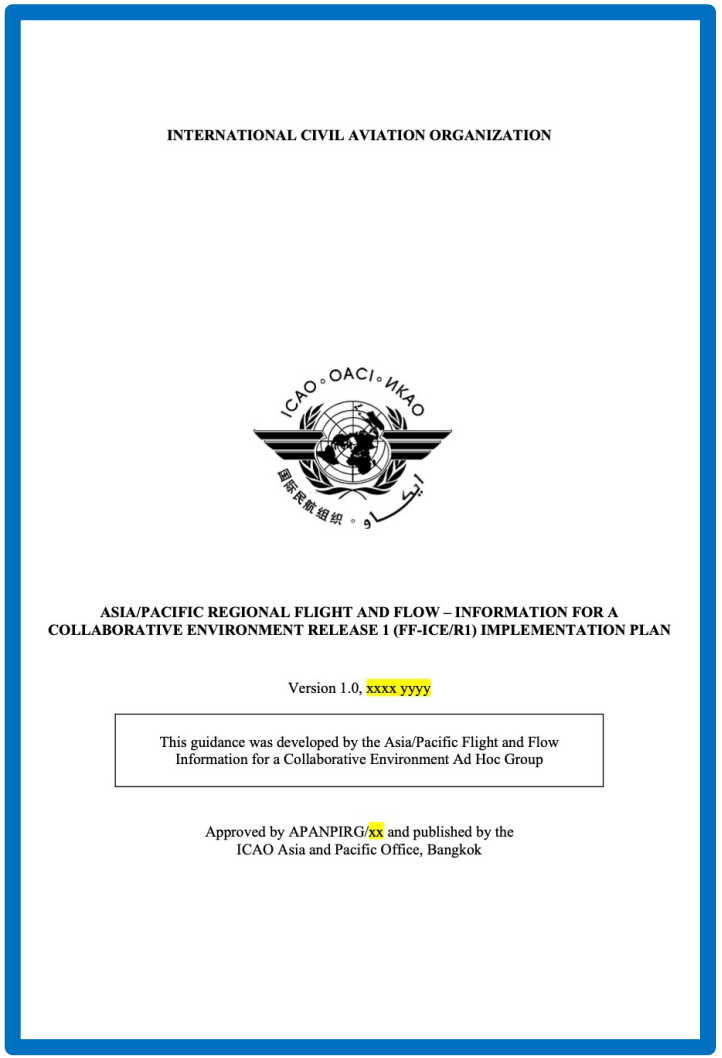
This guidance was developed by the Asia/Pacific Flight and Flow Information for a Collaborative Environment Ad Hoc Group

Approved by APANPIRG/xx and published by the ICAO Asia and Pacific Office, Bangkok

APAC Regional FF-ICE/R1 Implementation Plan

Relation between SWIM and FF-ICE

- SWIM, a key enabler for FF-ICE
- Regionally-agreed upon guidelines
  - → APAC **SWIM TI** Profiles, v1.0
  - → Standardized data formats
    - ⇉ **FIXM v4.3**
    - ⇉ **APAC Regional v4.3 Extension**
  - → APAC Common **SWIM Information Services**
    - ⇉ FF-ICE services
    - ⇉ If available, SWIM information services should be used to provide more details of applicable restrictions



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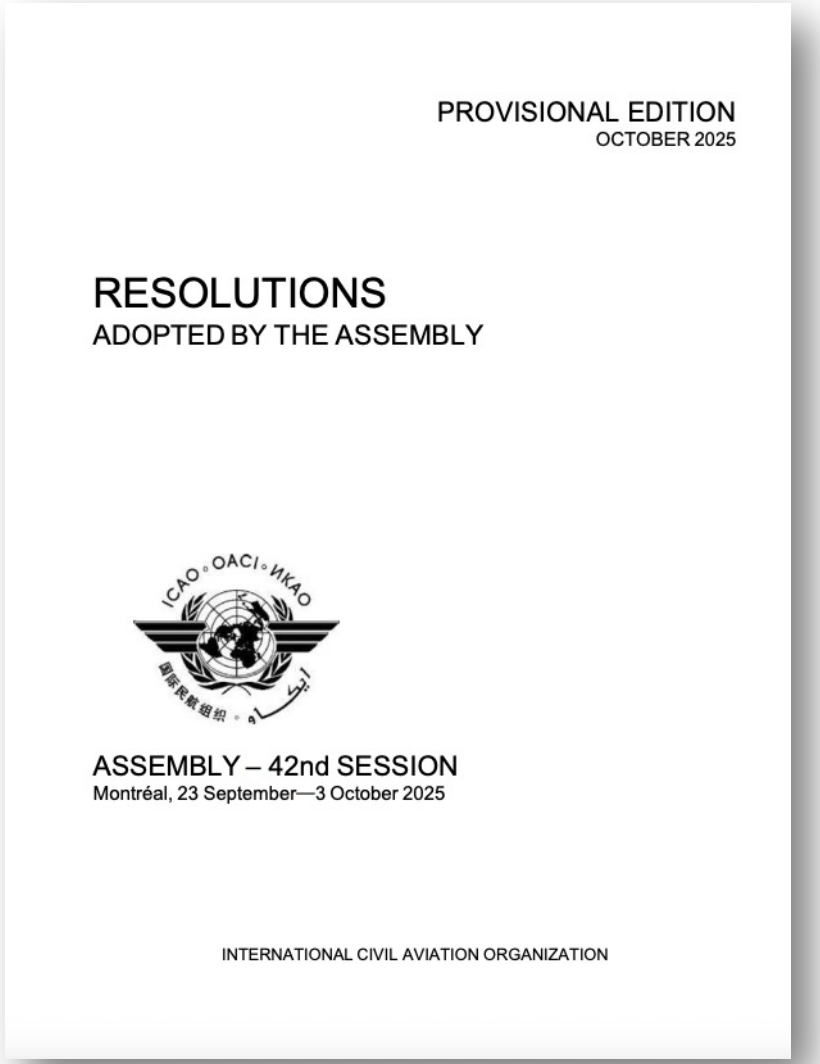
Minimum Implementation Path

Work In Progress



Resolution A42-6: ICAO global planning for safety and air navigation

Appendix B Global Air Navigation Plan (GANP)

- (8) Instructs the Council to continue developing the GANP, including **a roadmap of minimum capabilities** necessary for the evolution of the air navigation system and timelines for global implementation, keeping it current with evolving and emerging technologies and operational requirements;
- (9) Requests ICAO to incorporate principles of **service-oriented architecture** into the GANP, so as to guide air navigation service providers in the planning and implementation of agile, globally interoperable and future-ready systems to support seamless air traffic management;.

Draft Definition

Minimum Implementation Path (MIP) is a clearly defined baseline set of essential ASBU elements that all States should implement to ensure global interoperability, harmonization, and readiness for future air navigation modernization

Work in Progress

Draft Vision

MIP is a future-ready ANS modernization plan that supports progressive realization of the *time-based operations enabled by an information revolution by 2035* and will subsequently advance towards the long-term goal of *trajectory-based operations enabled by full connectivity through the internet of aviation by 2045*

Draft MIP Elements

S/N	Element ID	Element name
1	AMET-B2/1	Meteorological observations information
2	AMET-B2/2	Meteorological forecast and warning information
3	AMET-B2/4	Meteorological information service in SWIM
4	DAIM-B2/6	Provision of digital Aeronautical Information Publication (AIP) data sets
5	DAIM-B2/7	Provision of digital terrain data sets
6	DAIM-B2/8	Provision of digital obstacle data sets
7	DAIM-B2/9	Provision of digital aerodrome mapping data sets
8	DAIM-B2/1	Dissemination of aeronautical information in a SWIM environment
9	DAIM-B3/1	Provision of digital instrument flight procedure data sets
10	DAIM-B3/2	Daily airspace management information to support flight and flow
11	DAIM-B3/4	NOTAM replacement
12	FICE-B2/2	Filing service
13	FICE-B2/4	Flight data request service
14	FICE-B2/5	Notification service
15	FICE-B3/2	Flight information management service support for inflight re-planning
16	SWIM-B2/1	Information service provision
17	SWIM-B2/2	Information service consumption
18	SWIM-B2/4	Air/Ground SWIM for non-safety critical information
19	SWIM-B3/1	SWIM implementation framework
20	COMI-B1/1	Ground-Ground Aeronautical Telecommunication Network/Internet Protocol Suite (ATN/IPS)
21	COMI-B2/3	Links meeting requirements for non-safety critical communication

Work in Progress

Question & Discussion