Free Route Airspace Implementation Workshop

17-18 November 2026







INTERNATIONAL CIVIL AVIATION ORGANIZATION

Progressing Free Route Operations (FRTO) within Indonesia's Archipelagic

Beijing, China

17 – 18 November 2026

Outline

1. Background & Introductions

- The Starting Point
- The Concept
- Challenging Environment

2. Preparing FRTO Implementation

- Four Independent Pillar
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3. The Implementation of FRTO

- Implementation Strategy
- Challenges
- Current Publication
- Cross-border Alignment
- Participating Airlines & Benefit

Background & Introductions

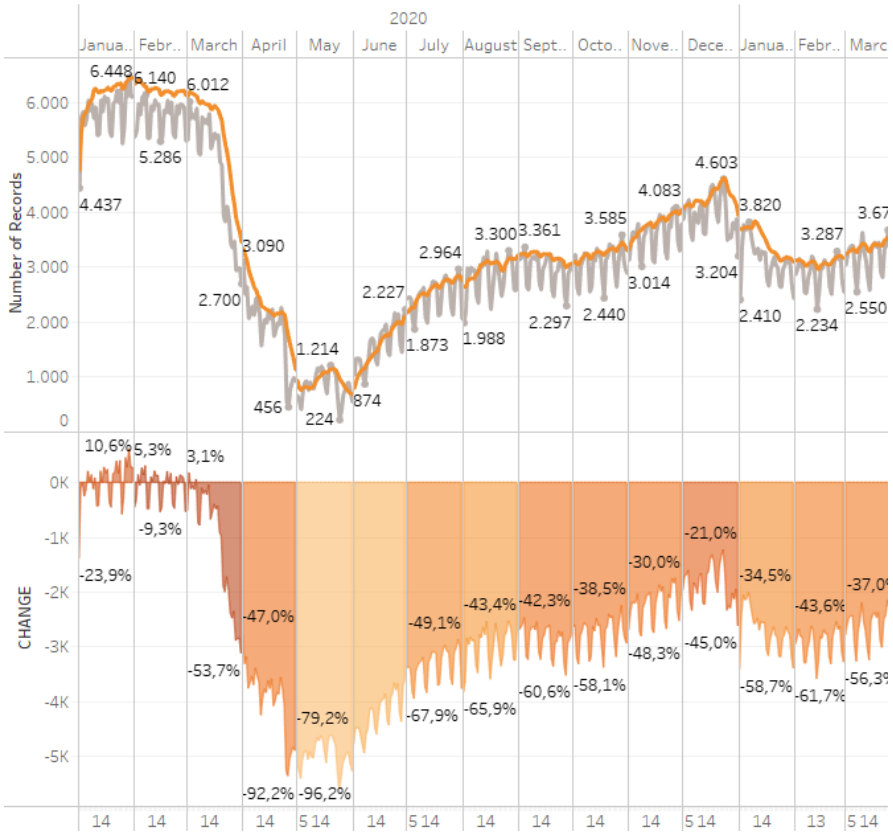
Initiating UPR in a pandemic

THE STARTING POINT

- Through the COVID-19 crisis, around **May and June 2020** , traffic levels fell sharply and the airspace carried only a small share of its normal movements.
- Responding to **IATA**'s request, AirNav, in coordination with **DGCA** , initiated a trial implementation of the **User Preferred Route (UPR)** concept as a strategic measure to stimulate traffic growth.
- AirNav collaborated closely with **IATCA** , the controllers' association, to secure operational buy-in and to keep the initiative **aligned with frontline ATC judgement.**

–90%

daily movements at the trough. An empty sky is the safest environment in which to learn something new



Daily traffic and year-on-year change from January 2020. The trough sits at 224 movements a day against 6,448 before the crisis.

Free routing, and what it changes for ATC

THE CONCEPT

User Preferred Route (UPR) comes from the ICAO **Free Route Operations (FRTO)** module. An airspace user plans its own route between a defined entry point and a defined exit point, may route via intermediate way points, and **never has to follow the ATS route network.**

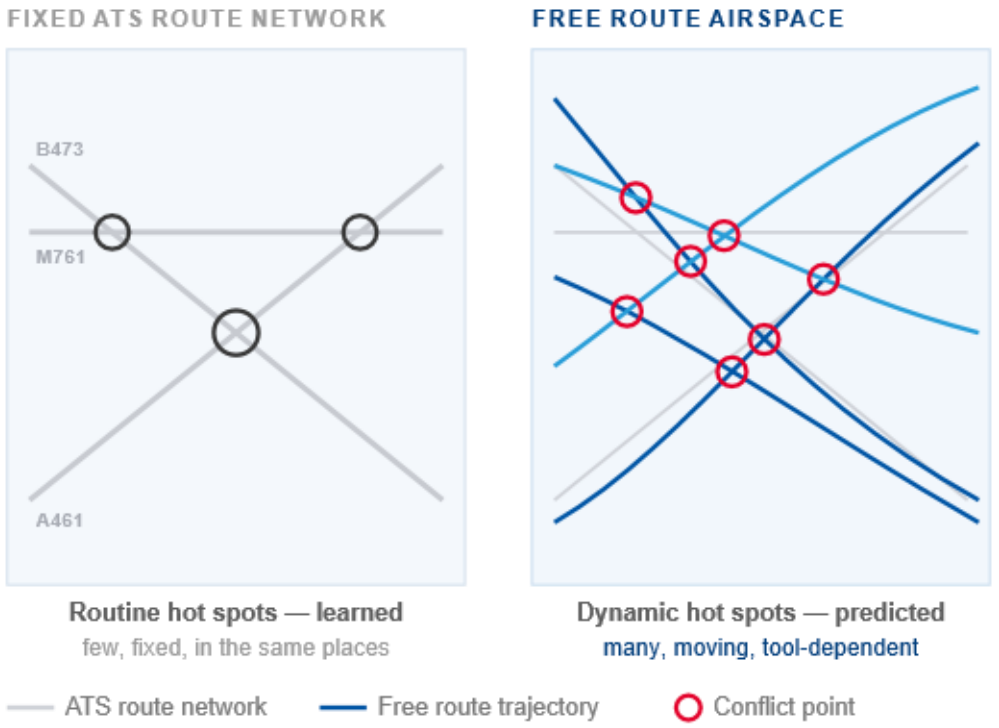
DCT
Direct Routing
routed via published waypoints

FULL FRTO
Designated points
expressed as LAT/LONG

An airline can fly the **most efficient route for that day** : wind speed and direction, turbulence, temperature, aircraft type and performance all go into the choice.

CONSEQUENCE FOR CONFLICT MANAGEMENT

Trajectories no longer sit on an ATS route, so **controllers cannot rely on the hot spots they know.** A single FRTO flight can open several new conflict points, and those points move.

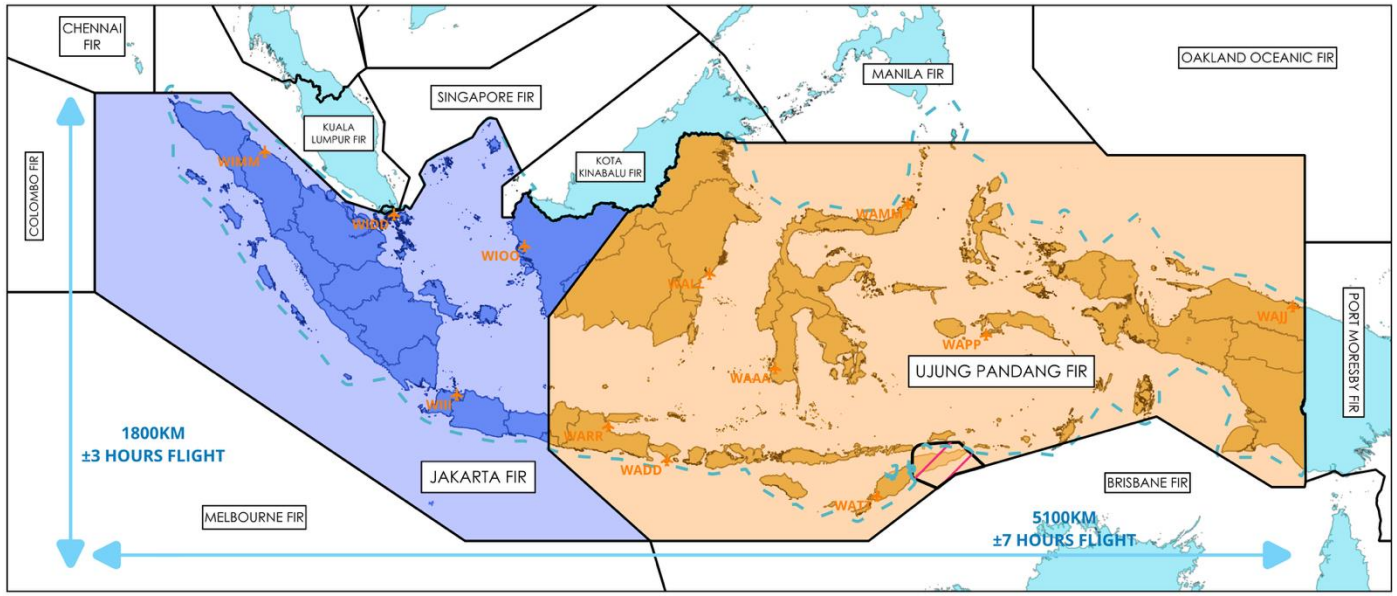


Indonesia Airspace Profiles

CHALLENGING ENVIRONMENT

Two FIRs cover **a vast archipelago** of more than seventeen thousand islands, holding **continental and oceanic sectors** side by side, some under **surveillance service** and others under **procedural control** , with ten adjacent FIRs on the far side of the boundary

2	**wide FIRs, two Area Control Centers**
10	**adjacent FIRs to coordinate with**
7.79M	**km², 17,000+ islands**



2 FIC ◆ **2** ACC ◆ **20** APP ◆ **17** APP/TWR ◆ **61** TWR ◆ **224** AFIS ◆ **12** ATMAS

Preparing FRTO Implementation

FRTO Implementation Framework

FOUR INTERDEPENDENT PILLARS

The four pillars operate iteratively rather than sequentially: an initial assessment across all four, implementation of what withstands it, then deliberate refinement of procedures, systems and business processes before the scope widens again.

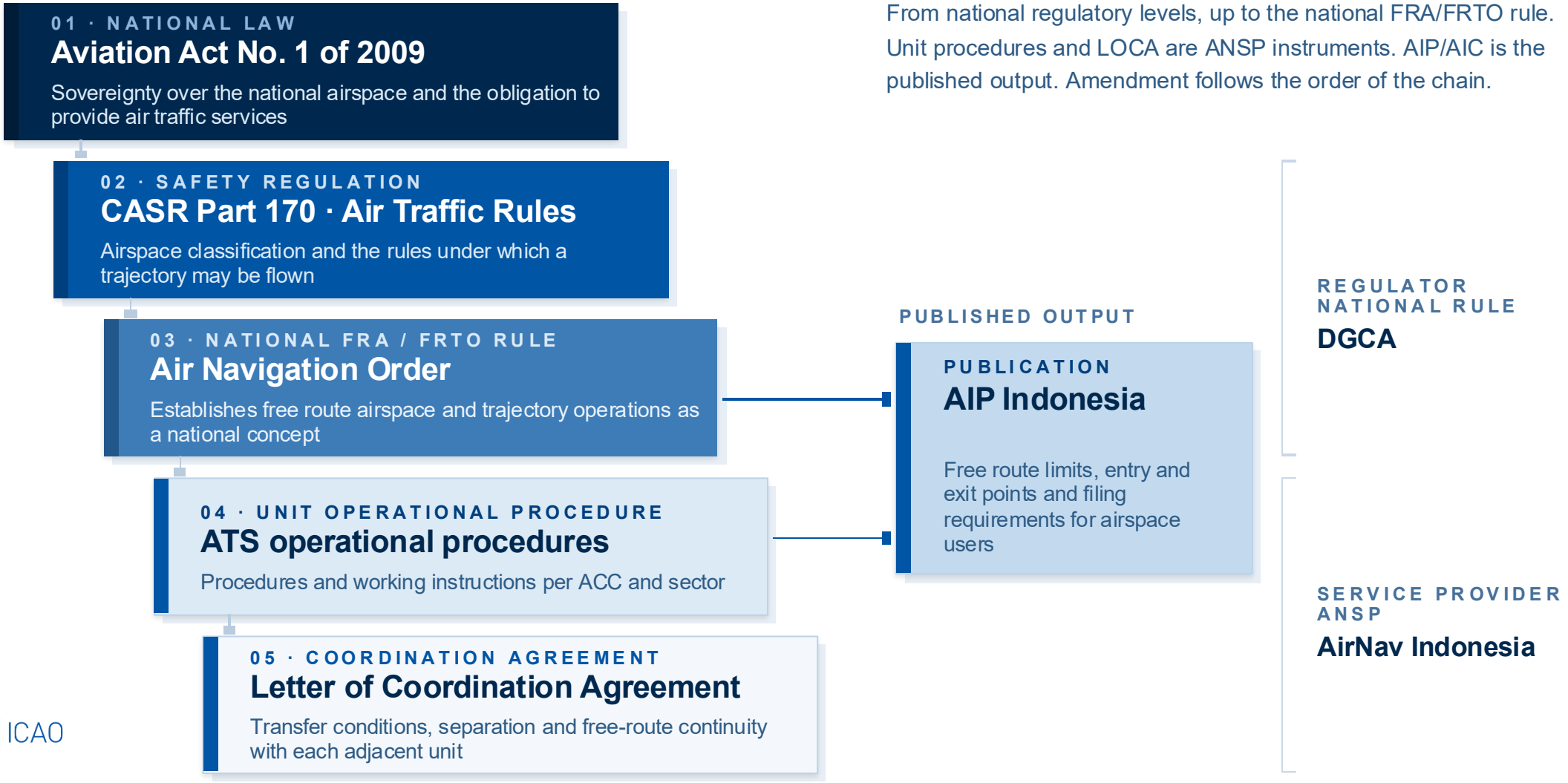


Each iteration is examined against **all four pillars** , with safety risk assessment governing the framework rather than accompanying it.

From the Act down to the letter of coordination

PILLAR 01 · REGULATORY FRAMEWORK

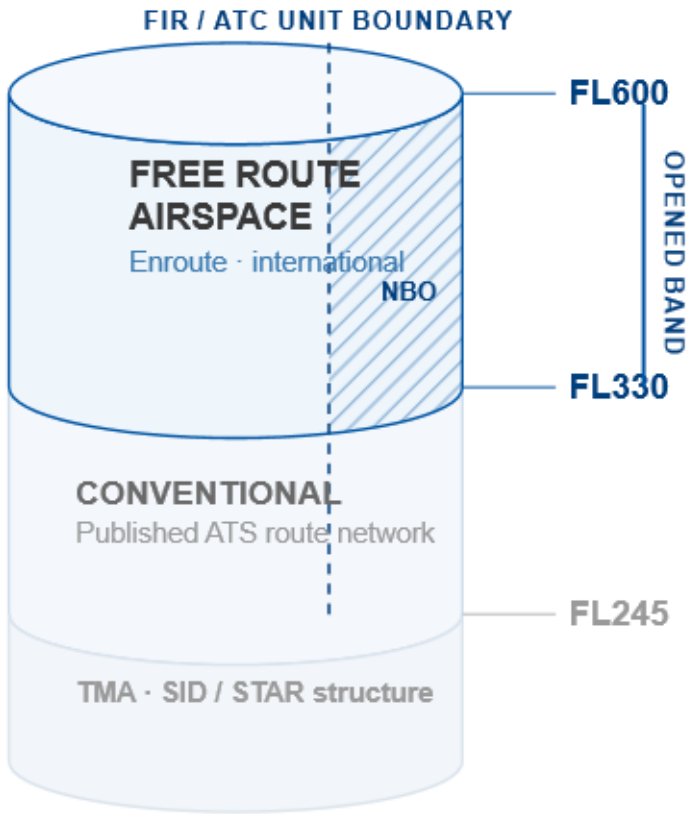
From national regulatory levels, up to the national FRA/FRTO rule. Unit procedures and LOCA are ANSP instruments. AIP/AIC is the published output. Amendment follows the order of the chain.



Organized by operational requirement, not by boundary

PILLAR 02 · AIRSPACE ORGANISATION

VERTICAL DIVISION OF THE AIRSPACE



Both limits, vertical and horizontal, follow where the traffic and the tools are rather than where the FIR and unit lines fall. Started simple and maintain control environment

01 · VERTICAL LIMIT

A level band chosen for the operation

Free routing opens between FL330 and FL600 inclusive; the published route network continues below it. That band was selected taking into consideration vertical sectorisation, level allocation, SID and STAR design, the traffic it carries and the complexity of the traffic, not necessarily by boundaries.

02 · HORIZONTAL LIMIT

Simple first, then widened

The first step admits direct routing on published waypoints only, within a controlled environment. Full-area free routing follows once the operation proves stable, and cross-border free routing once the adjacent unit is aligned.

03 · NEAR BOUNDARY OPERATION

Restraint near the boundary

Each letter of coordination is reviewed with the adjacent unit, the initial implementation stays clear of near-boundary areas, and flights operating close to the line are given the separation standard the neighbouring environment requires.

ATM automation system & flight planning

PILLAR 03 · ATM SYSTEMS & FACILITIES

01. FLIGHT PLANNING

Filing follows the FRA/UPR procedure & regulation

ITEM 10 **Equipment**

PBN capability, ADS-C, CPDLC and the rest of the required equipage.

ITEM 15 **FRA ASM rules**

Entry and exit points, intermediate points, designated points.

ITEM 18 **UPR remark**

The flight identifies itself as a user preferred route: RMK/UPRINA.

The filing system **and** the automation system both have to accept a trajectory written as waypoints or LAT/LONG, not only as a rigid ATS route.

02. RECONSTRUCT TRAJECTORY, PREDICTION, DETECTION & SAFETY NET

FPCF **Flight Plan Conflict Function**

MTCD **Medium Term Conflict Detection**

Flight data processing functionality that warns of potential conflict between flights in the area of responsibility. FPCF & MTCD parameter times are configurable.

TCT **Tactical Controller Tool**

Warns the executive controller of potential conflict inside the sector, combining current tracks with an accurate tactical trajectory, such as TOP & Ring Range.

RAM **Route Adherence Monitoring**

Flags a variation between the actual and the expected trajectory early. With no ATS route to fly along, RAM is what warns of a lateral deviation before it becomes a **loss of separation** or an **airspace infringement**.

Both systems were assessed: the flight planning system, which must carry the intended trajectory as filed, and the ATM automation, which must reconstruct that trajectory and keep it under controller command through conflict detection and adherence monitoring.



ATMAS human-machine interface, air situation display and the conflict tools as the controller sees them.

FRTO Training for ATC

PILLAR 04 · PERSONNEL

01 · REFRESH SYLLABUS

Rebuilt to accommodate the changes FRTO introduces.

CONCEPT

- FRTO · UPR · FRA concept
- Airspace management
- PBN for ATC

PROCEDURE

- ATC procedures
- Flight planning
- Coordination

SYSTEM

- ATMAS HMI
- Conflict detection tools
- Air situation display

HORIZON

- Towards trajectory based operation

02 · FLUENCY IN THE AUTOMATION

Refining the working method around the FRTO identification features, conflict detection and the safety nets that matter under free routing.

- MTCD
- TCT
- FPCP
- RAM

Training was initiated at the early assessment stage. Controllers were briefed on the concept and took part in drafting the operational procedures, and the refresh syllabus was rebuilt around the changes FRTO introduces to sector working methods.

SIMULATOR EXERCISES

Scenario-based, on the ATMAS simulator

Each exercise trains the controller to recognise a new conflict early and to work it through the automation features. The scenarios are written across a range of geometries and traffic pictures, anticipating how the control environment shifts under free routing.

TOWARD ICAO APAC PROJECT 30/10

30 NM oceanic & remote **10 NM** elsewhere

The FRTO syllabus aligns closely with what the Project 30/10 separation standards demand of a controller: Surveillance, PBN, PBCS, CPDLC and ADS-C competency, and confidence in performance-based minima.

UNCHANGED

Separation minima, phraseology, coordination and contingency all stand. Every flight stays under positive control.

CHANGED

Conflict can no longer be read off the route, so the automation now carries the picture.

The Implementation of FRTO

Start simple, stay in control, add complexity

IMPLEMENTATION STRATEGY

Implementation proceeded in four phases across both FIRs, each relaxing no more than two constraints — level band, lateral limits or traffic eligibility — and each assessed before the next was opened.

	PHASE 1 · TRIAL 08 JUN 2020	PHASE 2 · TRIAL 2021 – 2022	PHASE 3 · TRIAL 2022 – 2023	PHASE 4 · FULL OPS 5 OCT 2023
Vertical envelope Level band opened upward first, downward last	**F350 – F600** narrow band, upper airspace only	**F350 – F600** ceiling raised to airspace top	**F310 – F600** lower boundary extended downward	**FL330 – FL600** eligibility refined based on operational evaluation
Eligible traffic Eligibility itself used as a control measure	**Overflying only** stable environment while the concept matured	**Overflying only** eligibility held while levels widened	**Expanded to International Departure & Arrival** limited international flights admitted	**All International flights** domestic flights follow ATMAS modernisation & now using PBN routes
Point selection From the published network to designated points	**Published points** DCT — direct via existing waypoints	**User LAT / LONG** intermediate points user-designated	**Designated entry / exit** entry and exit points defined	**Full FRTO** free routing between designated points
Proposal requirement Changed from mandatory submission to notification-only	**12 - 6 hours before EOBT** proposal will be responded 3 hours after its submission	**Up to 3 hours before EOBT** proposal will be responded 2 hours after its submission	**Improving response time** allows more effective pre-tactical evaluation & ATC coordination	**No longer required** Notification only, without prior approval

A safety risk assessment ran at **every** phase, on the design and on the operation. Few variables moved at a time, so each assessment could **attribute what it saw.**

Challenges

ATM Automation System Capability

ATMAS limitation in processing latitude-longitude coordinate formats (in Jakarta ACC).

Operational Impact:

- FPL messages with unsupported coordinate formats are rejected by ATMAS.
- FDO officers must manually correct the rejected FPL messages. This increases FDO workload and FPL processing time.

Mitigation:

- Short-Term:
  - Determining the appropriate ICAO-compliant FPL format accepted by ATMAS; *degrees and minutes (11 char). E.g. 0102S10435E*
  - Provide targeted training for FDO personnel on handling and correcting rejected FPL messages.
- Medium: Upgrade ATMAS to support coordinate formats in FPL messages as ICAO standard.

Flight Planning Quality

- Use of unpublished waypoints or waypoints designated for SID/STAR operations.
- UPR routes inadvertently crossing Prohibited, Restricted, or Danger (PRD) areas.
- Incorrect or missing UPRINA remarks in FPL (Field 18).
- Incorrect application of UPR indicators to domestic, or flights outside Indonesian FIRs.

Operational Impact:

- Using unpublished & SID/STAR waypoints for en-route navigation is not appropriate and may result in FPL rejection at ATMAS.
- Routes crossing PRD areas require tactical ATC intervention.
- Limited UPR Monitoring: difficulty in identifying UPR flights affects monitoring, verification, and statistical reporting.
- Unnecessary attention and workload for CFPL and ATC personnel.

Mitigation:

- Enforce the use of waypoints published in AIP ENR 4.4.
- Airline Engagement. Communicate identified errors directly to airlines and through IATA to ensure compliance with AIP requirements.

ATC Personnel

ATC Personnel Challenges

- Potential Resistance; to adopt new operational concepts and procedures.
- Workload Concerns; about additional workload from UPR monitoring and verification.
- Safety Concerns; about separation management, conflict detection, and situational awareness.
- Limited Knowledge & Understanding. Different levels of understanding of FRA/UPR concepts, procedures, and operational benefits.

Mitigation Measures

- Knowledge Assessment; Conduct ATC surveys to assess personnel understanding of FRA/UPR.
- Awareness Campaign; Develop dedicated UPR flyers and videos explaining the concept, procedures, and benefits.
- IATCA Engagement; Involve IATCA in promoting UPR benefits for airspace users and AirNav Indonesia to encourage ATC support.
- Targeted Briefing; Conduct familiarization sessions addressing operational procedures, safety aspects, and workload concerns.

Current FRTO Implementation

Following comprehensive operational evaluation and assessment, AirNav Indonesia formalized the operational framework for UPR implementation in Indonesia through **AIRAC AIP Amendment 135, effective 5 October 2023**.

AirNav Indonesia remains committed to continuous improvement and **welcomes feedback from airline operators** regarding UPR implementation. All feedback will be subject to a thorough assessment, with particular emphasis on operational safety, before any amendments to the existing provisions are established and implemented.

AIRAC AIP AMDT 135 05 OCT 2023

Implementation

Effective since **5 October 2023**

Indonesia has fully implemented **UPR**

Availability

within **Jakarta FIR** & **Ujung Pandang FIR**

Eligible Level **FL330 – FL600**

Applicability

for **International Overflying, Arrival & Departure flight**

Aircraft Minimum Requirements*

RVSM

RNP10/RNAV10

GNSS

ADS-B

**) Must be notified in the FPL*

Contact us

E-fpl@airnavindonesia.co.id

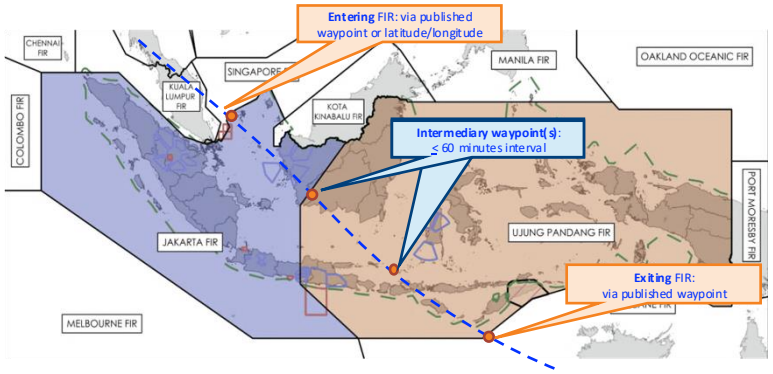
Flight Planning Requirements

1. **Entering FIR**; may plan via published waypoints, or a position designated as latitude/longitude at the FIR common boundary.
2. **Exiting FIR**; may be planned via published waypoint.
3. **Intermediary point**; may plan via published waypoints, naviga-tion aids, and/or position designated as latitude/longitude.
4. May **include published** ATS routes.
5. If operating within Jakarta FIR and Ujung Pandang FIR for more than 60 minutes, shall plan via intermediary waypoint(s) with time **interval not exceeding 60 minutes**.
6. **Shall avoiding** Prohibited, Restricted, Danger (PRD) areas, and reserve/blocked airspace.
7. **Waypoints shall use** waypoints as published in AIP Indonesia part ENR 4.4.

Flight Plan Details

Position format (lat/long): Degrees and minutes (11 characters). E.g. **0102S10435E**

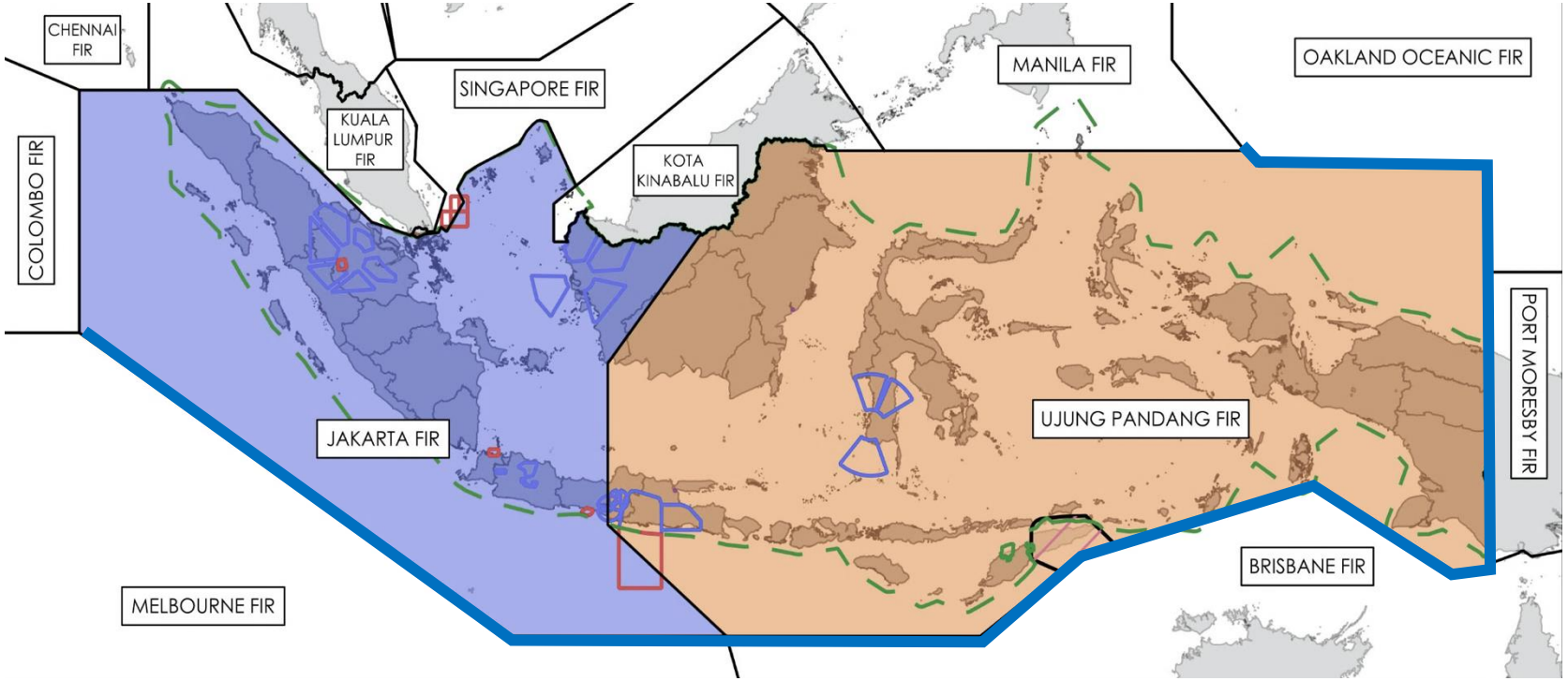
In item 18 of the FPL (RMK/): fill the word "**UPRINA**"



Expansion FRTO with the Neighbouring FIRs

CROSS-BORDER ALIGNMENT

Free routing terminates extends across FIR boundary once the adjacent unit operates. Extension was therefore taken one boundary at a time, each under trial before full operation, and each requiring the Letter of Coordination Agreement to be amended for transfer conditions, separation and route continuity.



CROSS-BORDER STEPS

MAR 2023
Ujung Pandang – Oakland FIR
FRTO, full operation

23 OCT 2023
Jakarta – Singapore FIR
DRO, trial

MAR 2024
Jakarta – Melbourne FIR
FRTO, trial

MAR 2024
Ujung Pandang – Brisbane FIR
FRTO, trial

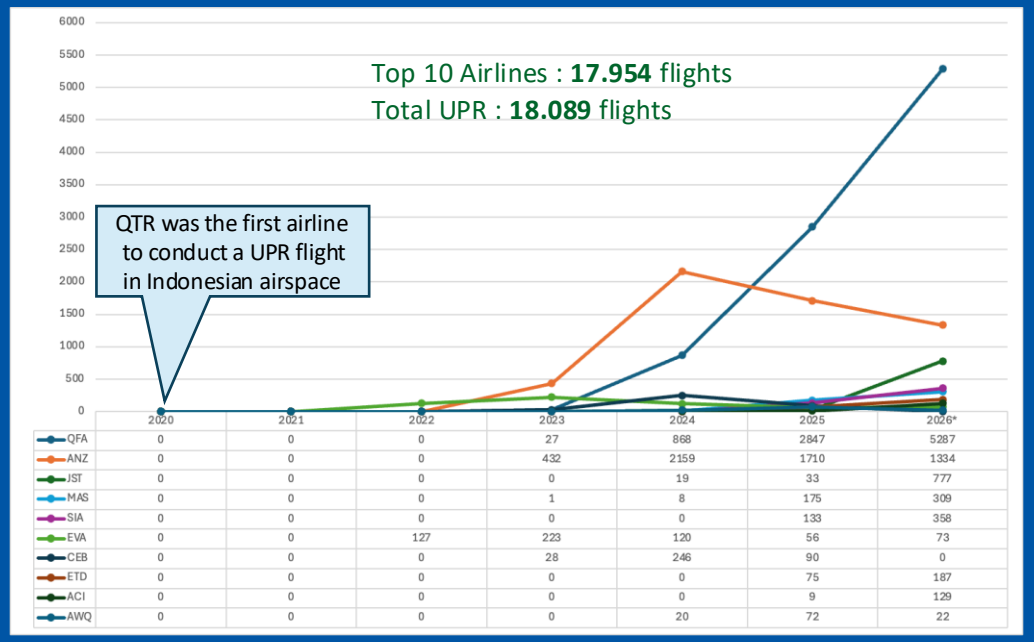
JUN 2024
Ujung Pandang – Port Moresby FIR
FRTO, full operation

AUG 2024
Southeast Asia – Oceania
FRTO, letter of intent

JUL 2025
Indonesia – Australia
FRTO, full operation

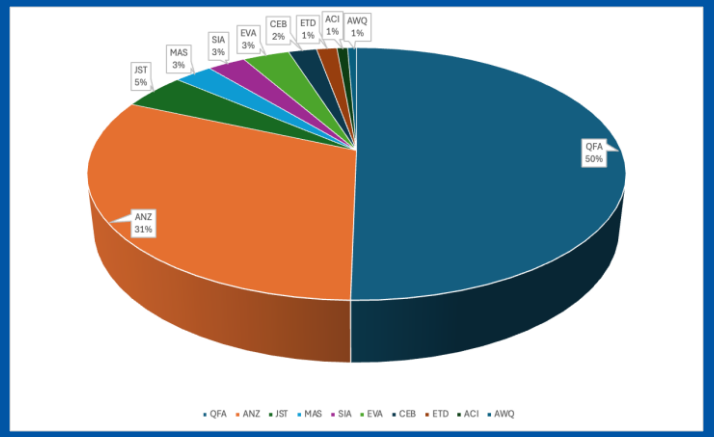
Participating Airlines & Benefit

The Top 10 Airlines in 2020 – 2026*



	2020	2021	2022	2023	2024	2025	2026*
QFA	0	0	0	27	868	2847	5287
ANZ	0	0	0	432	2159	1710	1334
JST	0	0	0	0	19	33	777
MAS	0	0	0	1	8	175	309
SIA	0	0	0	0	0	133	358
EVA	0	0	127	223	120	56	73
CEB	0	0	0	28	246	90	0
ETD	0	0	0	0	0	75	187
ACI	0	0	0	0	0	9	129
AWQ	0	0	0	0	20	72	22

*) *Until September 2026*



Airline feedback on UPR benefits received in 2024 and documented in an IATA Working Paper at ICAO ATM/SG/13 (2025).

From the ANSP perspective, AirNav Indonesia has also conducted its own assessment, covering the period from the initial implementation through 2025. Our assessment indicates that UPR implementation has contributed to a reduction of more than 5 tonnes of CO_2 emissions.

Airlines' Perspectives

ATM/SG/13 – WP/42 Rev.1
25 – 29/08/2025

International Civil Aviation Organization

ICAO **Thirteenth Meeting of the Air Traffic Management Sub-Group (ATM/SG/13) of APANPIRG**

Singapore, 25 ▨ 29 August 2025

Agenda Item 6: ATM Coordination (Meetings, Route Development, Contingency Planning)

UPDATE ON SOUTH-EAST ASIA-OCEANIC IMPLEMENTATION OF FREE ROUTE OPERATIONS (FRTO) PROJECT

(Presented by IATA, Co-sponsored by IATA, Civil Aviation Authority of Singapore, AirNav Indonesia, Airservices Australia and Airways New Zealand)

SUMMARY

This paper presents an update on the operational trials conducted by the South-East Asia-Oceanic Implementation of Free Route Operations (SEA-O FRTO) project team in several adjacent FIRs in the Asia and Pacific Regions (APAC) under the APAC ANSP Committee (AAC) Workstream 4.

Table 1: Reported Benefits – Airline 1

Month	Total No. of Flights on UPR	Total UPR Fuel Savings	Total UPR CO_2 Savings*
Aug 2024	160	24T	75.8T
Sep 2024	154	29T	91.6T
Oct 2024	152	19T	60.0T
Nov 2024	147	26T	82.2T
Dec 2024	151	20T	63.2T
5-Month Trial	764	118T	372.8T

a) *CO2 emissions = 3.16 x fuel consumed (ICAO CORSIA CO2 emissions factor);
b) participation was approximately 35% flights, with average fuel saving 150kg per flight; and
c) flight time and track mile differences were not tracked however estimated to be below five minutes (average flight time saving) and 25 NM (average track mile saving).

Total 3 airlines for 5 months operation in 2024:

Fuel saving 615 T
CO2 reducing 1.394 T

Table 2: Reported Benefits - Airline 2

	Time Savings per flight	Total UPR Fuel Savings	Total UPR CO_2 Savings*
City Pair (out)			
Single leg	6 mins	864kgs	2,730kgs
Weekly (x4)	24 mins	3,456kgs	10,921kgs
City Pair (return)			
Single leg	7 mins	839kgs	2,651kgs
Weekly (x4)	28 mins	3,356kgs	10,605kgs
Weekly Total	52 mins	6,812kgs	21,526kgs
5-Month Total (~x 20 Weeks)	~1,040 mins	136,240kgs	430,518kgs

Table 3: Reported Benefits - Airline 3

	Total UPR Fuel Savings	Total UPR CO_2 Savings*
Dry Season (6th Aug 24 to 13th Sep 24) - 37 days of data		
(from city-pair averages)	46,685kgs	147,525kgs
Average participation 32%		
Wet Season (1st Nov 24 to 3rd Jan 25) - 64 days of data		
(from city-pair averages)	314,041kgs	992,370kgs
Average participation 48%		
Totals	360,726kgs	1,139,895kgs

Table 4: Total Reported UPR City-Pair Benefits from ¾ of the Participating Airlines

Total UPR Fuel Savings	Total UPR CO_2 Savings*
614,966kgs	1,394,134kgs

AirNav's Assessment

FUEL SAVINGS TO AIRLINES, 2025

USD 8.04M

CO_2 EMISSIONS AVOIDED, 2025

5,426 t

Not emitted because the fuel was never burned 3.16 t of CO_2 per tonne of jet fuel saved.

Key Takeaways

LESSON LEARN FROM INDONESIA'S FRTO IMPLEMENTATION

1. **Start small, expand safely**
   Begin with a limited airspace, flight level band, and eligible traffic. Expand progressively based on operational experience and safety risk assessments.

2. **Build readiness across four pillars**
   Align regulations, airspace organizations, ATM systems, and personnel from the beginning. FRTO readiness depends on all four working together.

3. **Involve controllers and airlines early**
   Engage frontline controllers in procedure development and training. Use airline feedback to identify operational benefits and opportunities for improvement.

4. **Ensure automation can support free trajectories**
   Verify that flight planning and ATM systems can process user-defined routes and provide effective conflict detection, trajectory prediction, and route adherence monitoring.

5. **Treat cross-border FRTO as a joint undertaking**
   Coordinate with neighbouring ANSPs early, conduct boundary-specific trials, and align transfer conditions, separation standards, and procedures before expanding.

Thank You



ICAO