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Free Route Airspace implementation in the Emirates FIR

Eighth Meeting of the Performance Based Navigation Sub-Group
(PBN SG/8)
(Doha, Qatar, 12 - 13 December 2023)

Free Route Airspace (FRA) – What & Why?

What

- Airspace within which users may freely plan a route between a defined entry point and a defined exit point
- The route can be planned directly from one to the other or via intermediate (published or unpublished) way points, without reference to the ATS route network

Why

- Reduced operating expenses
- Reduced environmental impact
- Optimized payload

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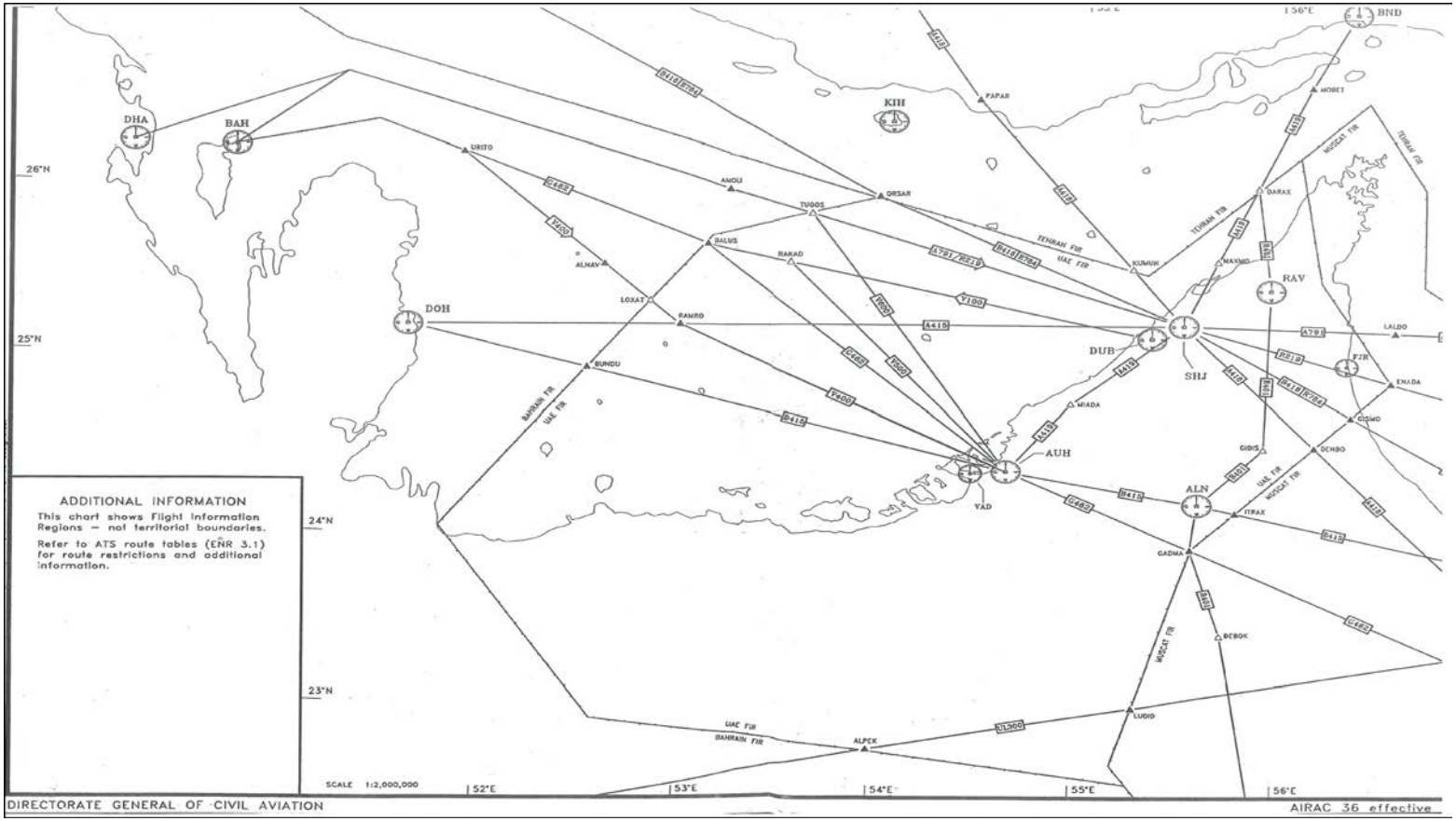
History of the Emirates FIR (Prior 2011)



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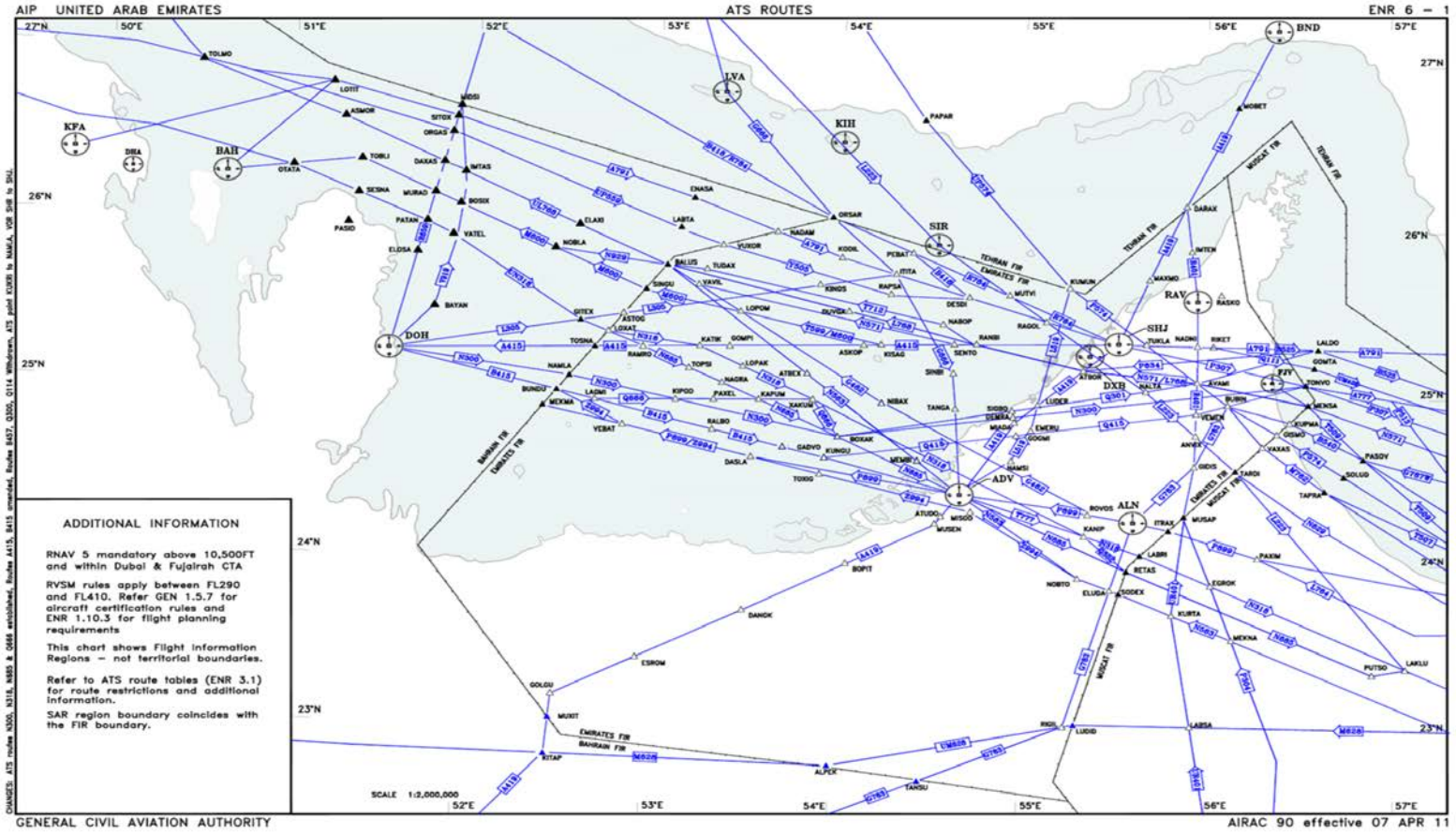
The Evolution of the Emirates FIR - 2011



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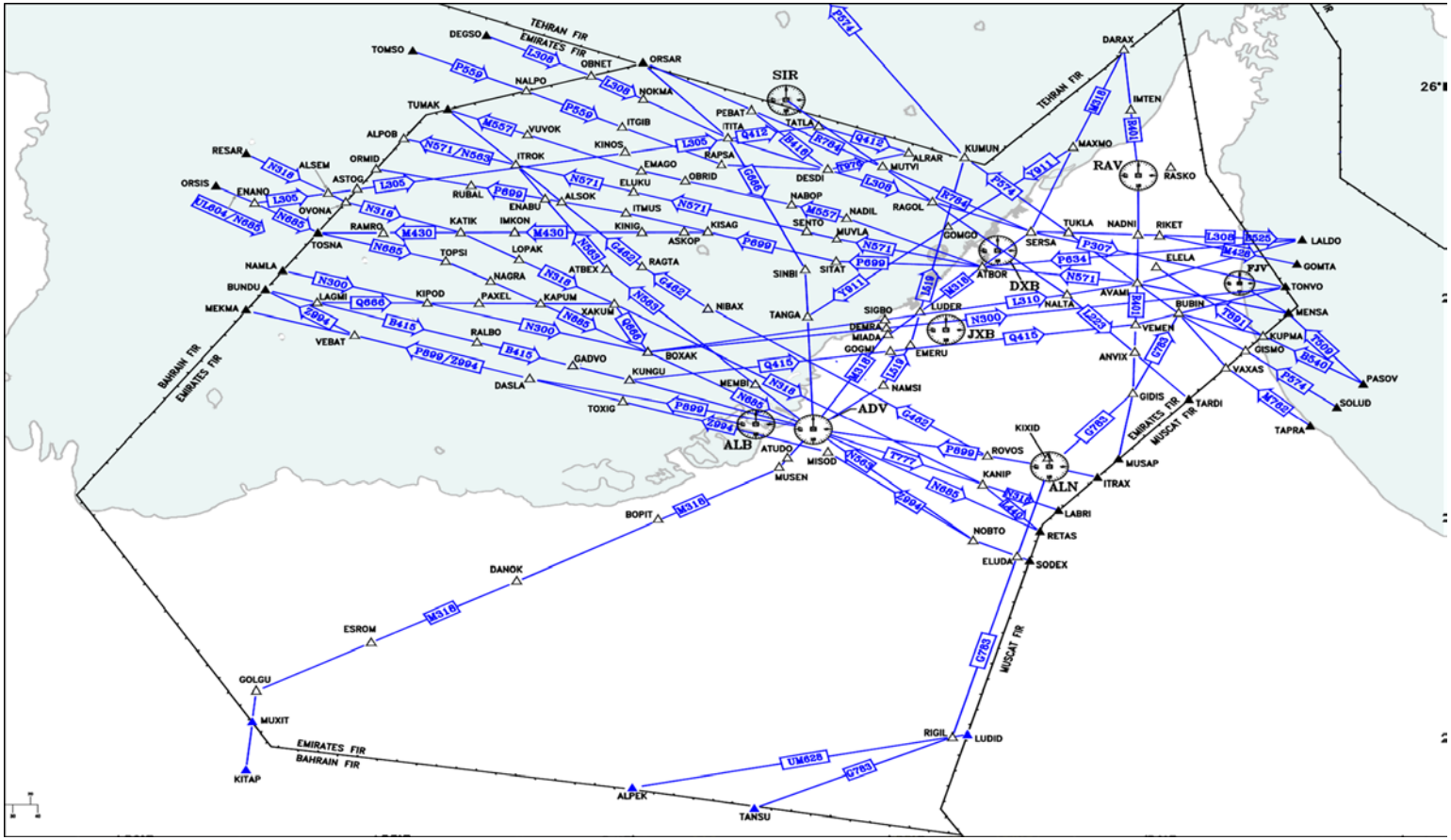
The Evolution of the Emirates FIR – 2014 to 2017



FRA Plan

Develop Conceptual Design — AUG 2022

Benchmark with NATS — Oct 2022

Draft Operational Procedures — Nov 2022

Prepare Training Package — Dec 2022

Impact Study on Expected Outcomes — Jan 2023

Prepare AIP material for Publication — Apr 2023

Jul 2023

FRA concept design and challenges

- Infringement of neighboring FIRs
- Infringement of PDRs
- Emirates FIR sectorization
- Airspace complexity
- Climb & descent restrictions

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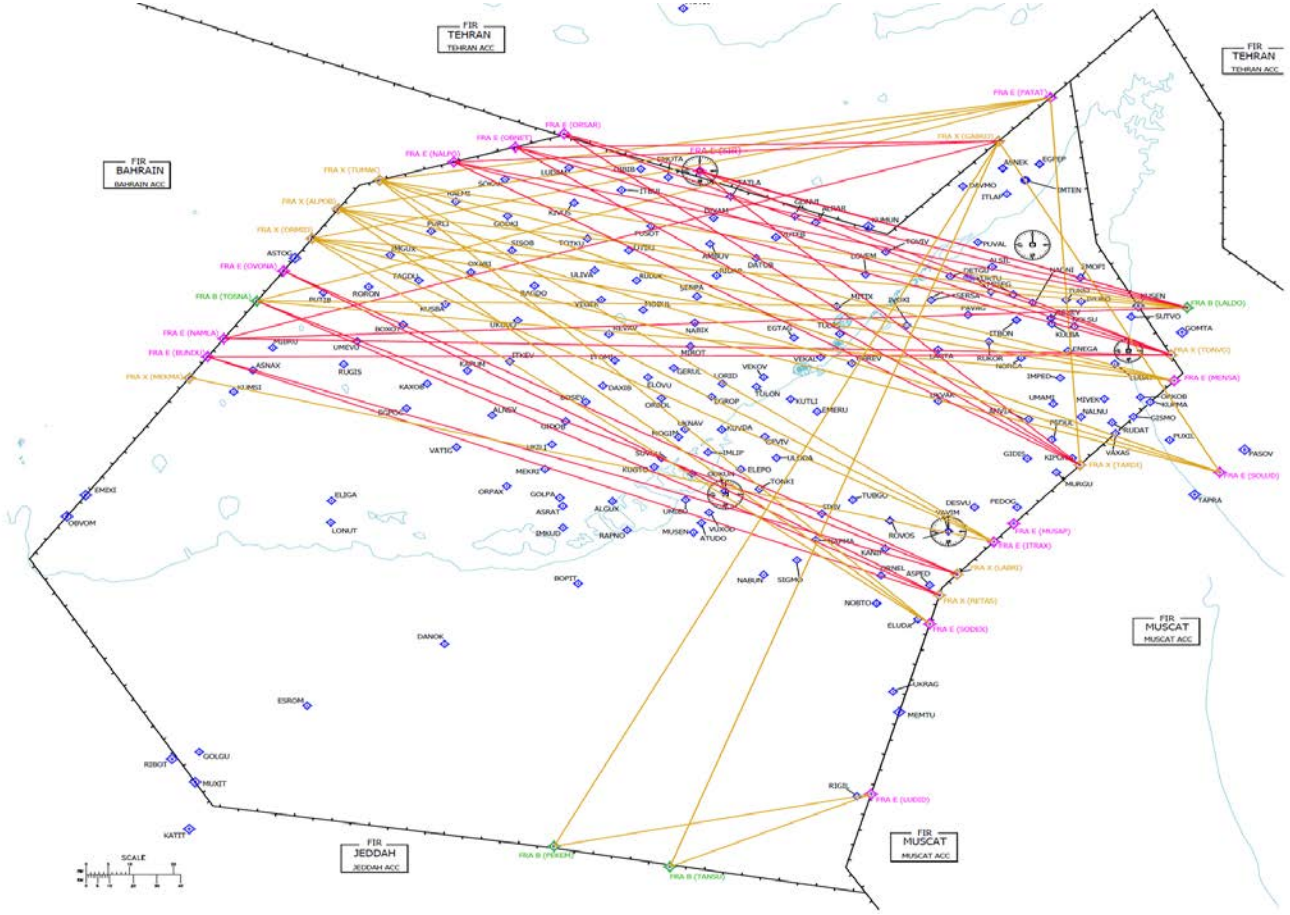
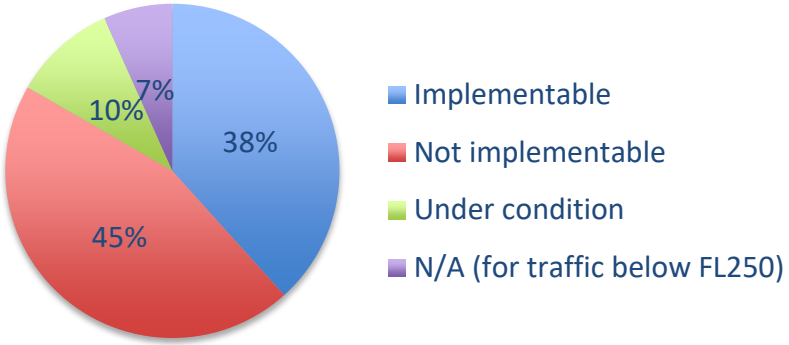
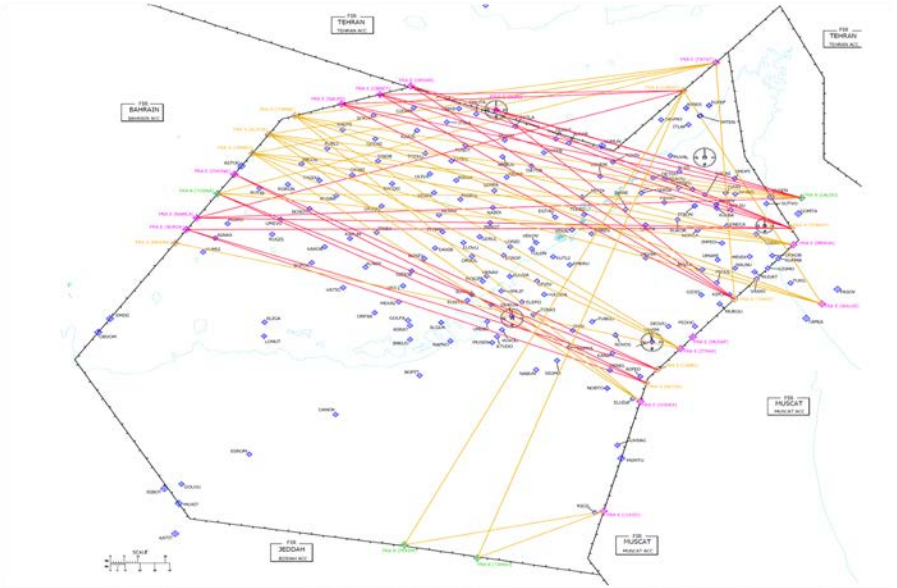
FRA concept design and challenges



FRA concept design and challenges

Current routing analysis





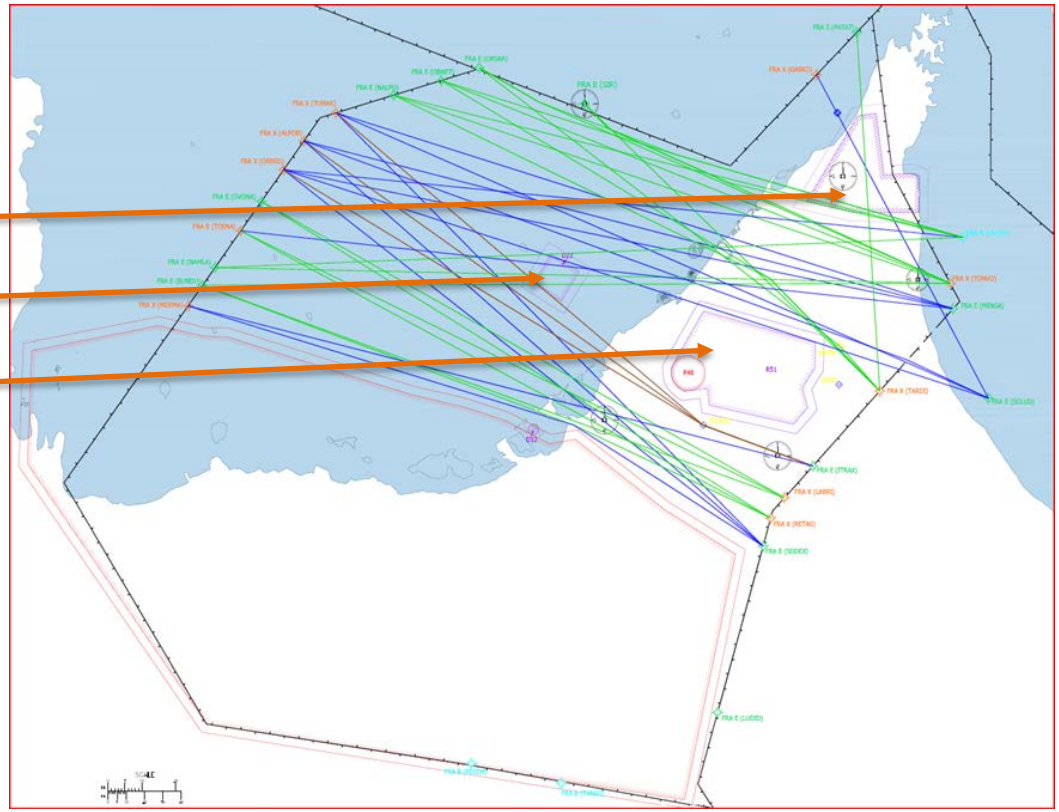
All initial DCT Routing possibilities	60
Implementable	23
Not implementable (due to infringement of neighboring FIR or P,D,R)	27
Implementable Under condition (depends on activity of P,D,R)	6
N/A (for traffic below FL250)	4

Implementable Possibilities

Effective civil/military coordination to lower:

- OMR67
- OMD22
- OMR51

in AIP to FL300 for greater flexibility and instant release to military as per operations



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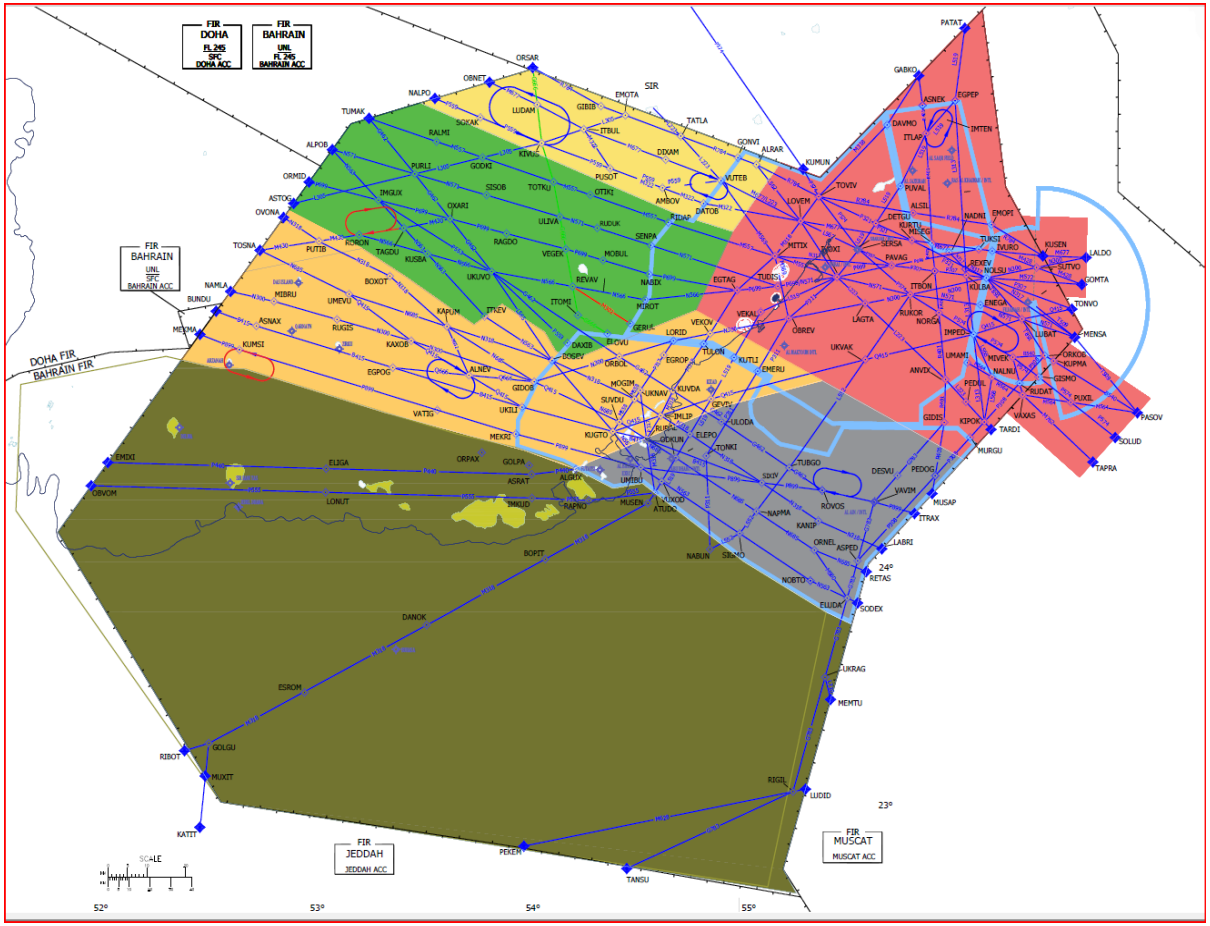
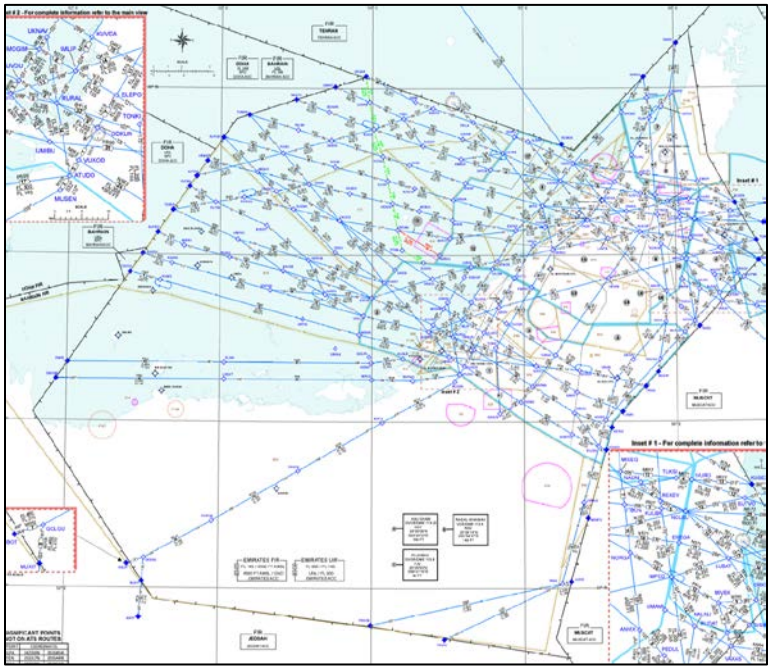
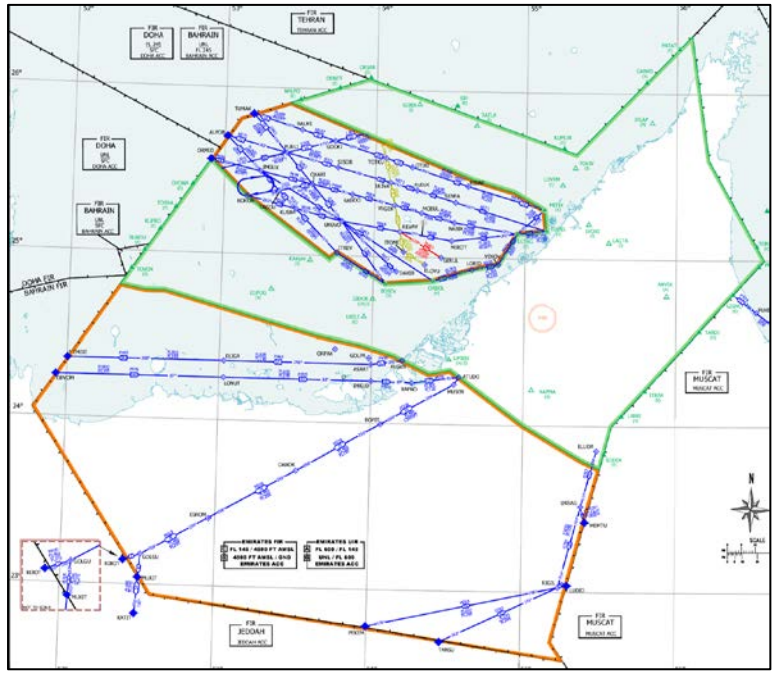
Emirates FIR High Sectorization



Transition to FRA





FRA Significant Points Definitions

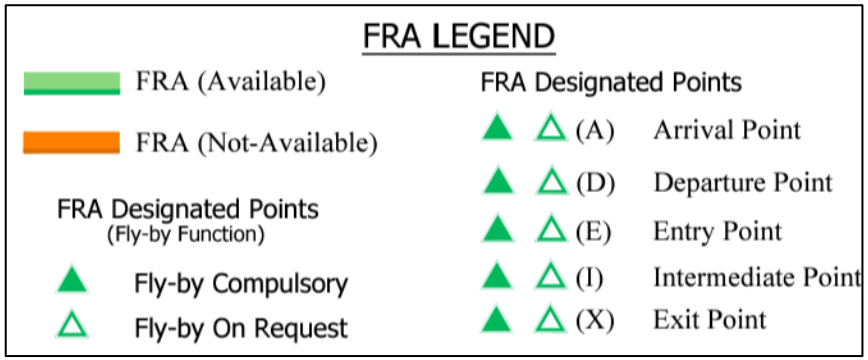
In the absence of standardized guidance for FRA Significant Points Definitions, we adopted best practices from mature FRA infrastructures. This approach avoids the creation of new standards, ensuring simplicity for airlines and stakeholders. Furthermore, widespread adoption by ICAO would enhance its effectiveness in the future.

FRA Horizontal Entry Point (E)

A published Significant Point on the horizontal boundary of the Free Route Airspace from which FRA operations are allowed

FRA Horizontal Exit Point (X)

A published Significant Point on the horizontal boundary of the Free Route Airspace to which FRA operations are allowed



FRA Significant Points Definitions

FRA Intermediate Point (I)

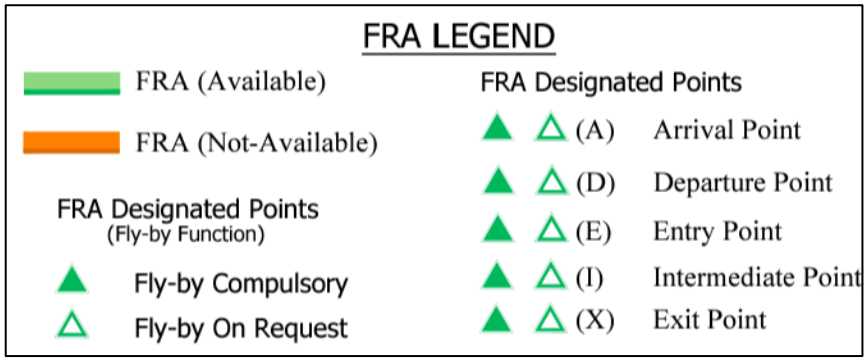
A published Significant Point inside the FIR which FRA operations are allowed

FRA Arrival Connecting Point (A)

A published Significant Point to which FRA operations are allowed for arriving traffic to specific aerodromes.

FRA Departure Connecting Point (D)

A published Significant Point from which FRA operations are allowed for departing traffic from specific aerodromes



FRA Concept Horizontal Rules

- **FRA Horizontal Entry (E) and Exit (X) points Rules:**
  - Entry to and exit from FRA is done only over the significant points published and defined as FRA Horizontal Entry and FRA Horizontal Exit
  - These points retain their functions from ATS route network (e.g. points which are entry-only remain entry-only in FRA)
- **FRA Intermediate (I) points Rules:**
  - Airspace users may file FRA Intermediate points between FRA Horizontal Entry and FRA Horizontal Exit points, circumnavigate a particular area, indicate a change in flight level or speed, or remain compliant with FRA boundaries rules. However, this might be limited within the Emirates FRA due to needs of neighbouring ANSPs who do not offer FRA
- **FRA Horizontal General Rules:**
  - The FRA AIP package has been designed to provide users with appropriate guidance to submit correct FPL.
  - Incorrect FPL might be subject rejection or manual correction
  - Segments between FRA Horizontal Entry, FRA Horizontal Exit and FRA Intermediate points are to be indicated by DCT in ITEM 15: ROUTE of the flight plan

FRA Concept Vertical Rules

- **Vertical transition due change of cruising level**
  - Flights that make a change in cruising flight level resulting in a transition to/from FRA shall file the portion of the flight outside FRA along the standard ATS route network
    - Traffic cruising at FL360 will be in FRA, but if operator asks for a descent to FL340 this would make the flight leave FRA environment and flight would be subject to standard routing or ATC clearance.

- **Vertical transition to / from airports**
  - Flights arriving to or departing from airports (local or located outside but close to the boundaries of FRA area) may file a flight plan in accordance with FRA rules even if a portion of their flight is below the lower limit of FRA
    - UAE AIP ENR 1.9.10 provides detailed information on these airports
  - In these cases operators file a “free route” from/to a published FRA Horizontal Entry / Exit point to/from Airports, a published FRA Arrival / Departure Connecting point shall be indicated in the flight plan

Emirates FIR - FRA Phase 1

- **Based at FL355 & above**
- **Covers most of the FIR, and where its excluded we've ensured most DCT routing for airspace users**
- **Maintaining same entry & exit points at FIR boundary**
  - **Minimizing change on users**
  - **Minimizing change on neighboring ANSPs**
  - **Ensuring smooth and harmonious operations**
- **Utilization of existing waypoints as intermediate, entry & exit points to FRA**
  - **Easier implementation due to familiarity with current waypoints from frequent users of the FIR**
- **Availability of departure points (D), and arrival points (A), provides accessibility to traffic transiting the FIR on the climb or on the descent to either enter or exit the FRA environment**

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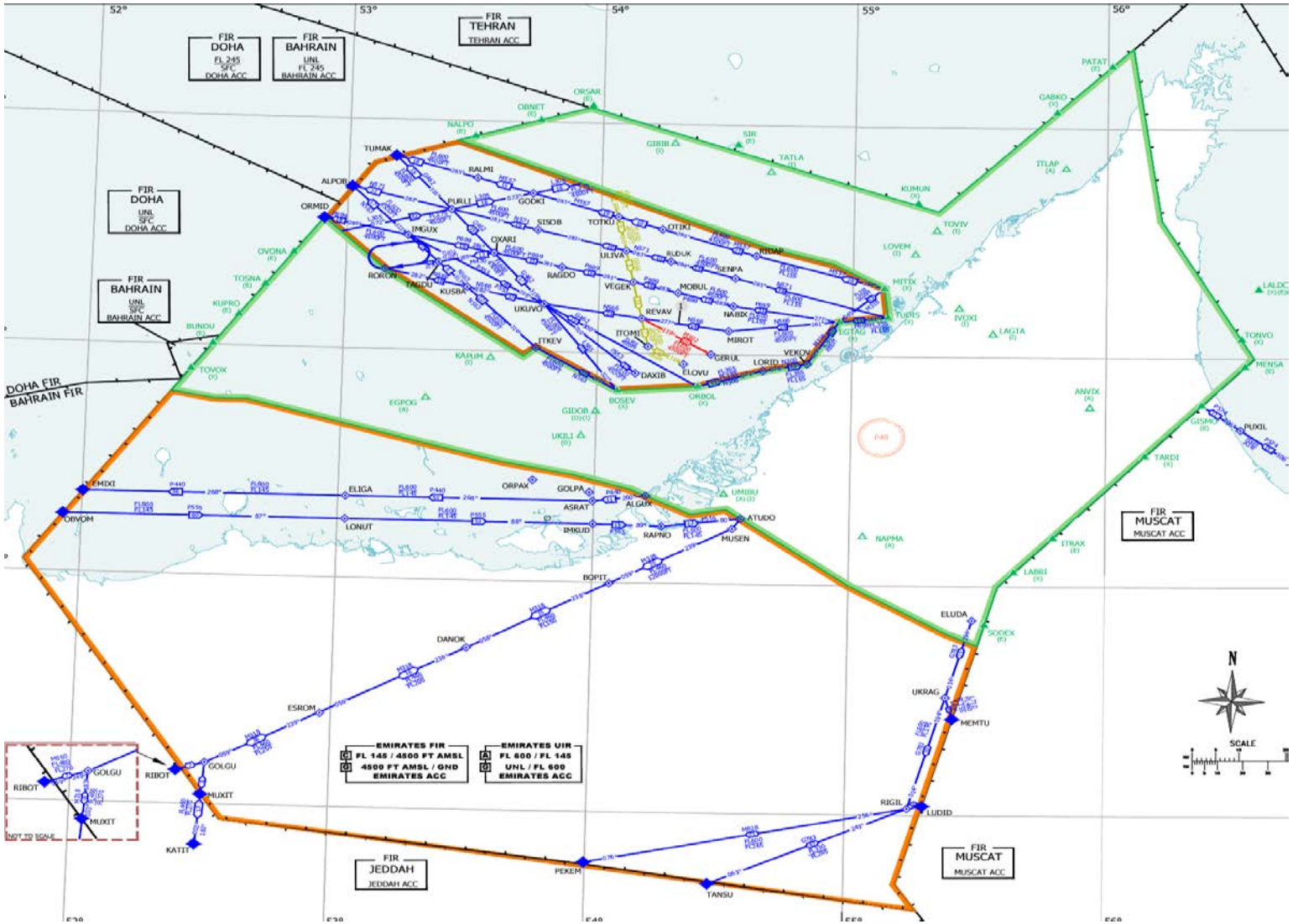
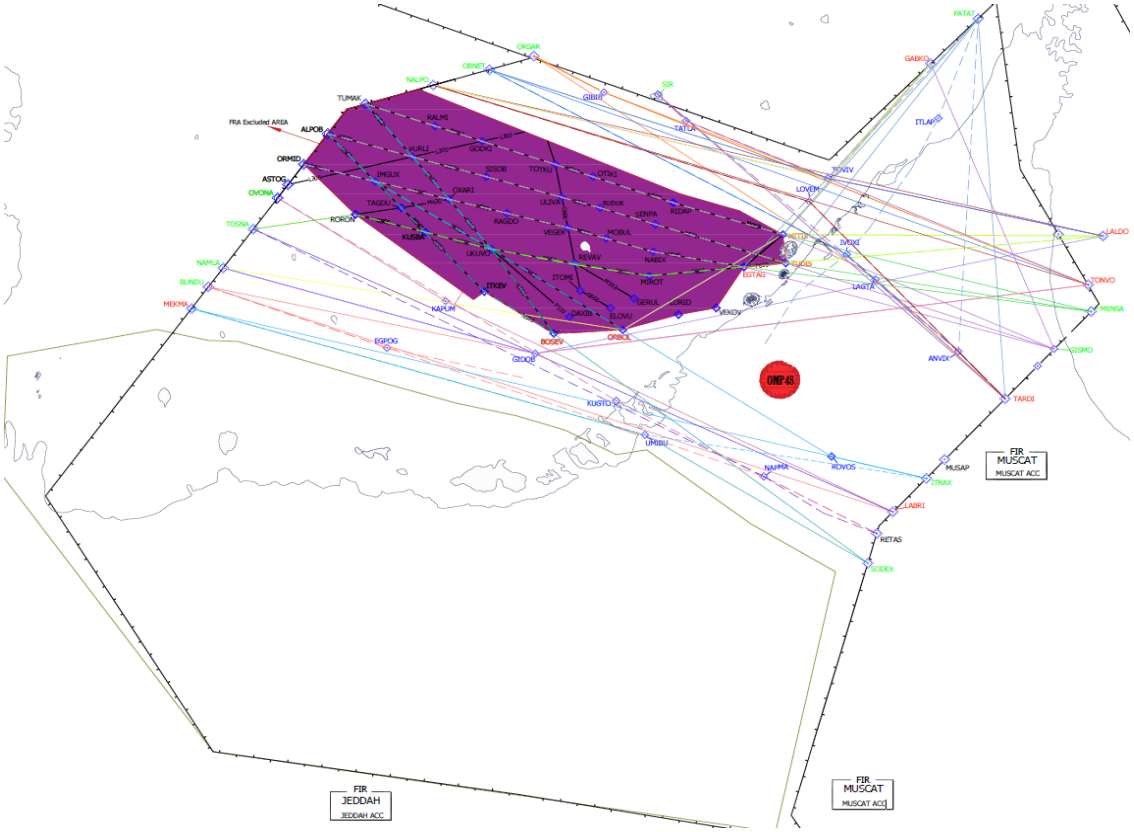
Emirates FRA Phase 1



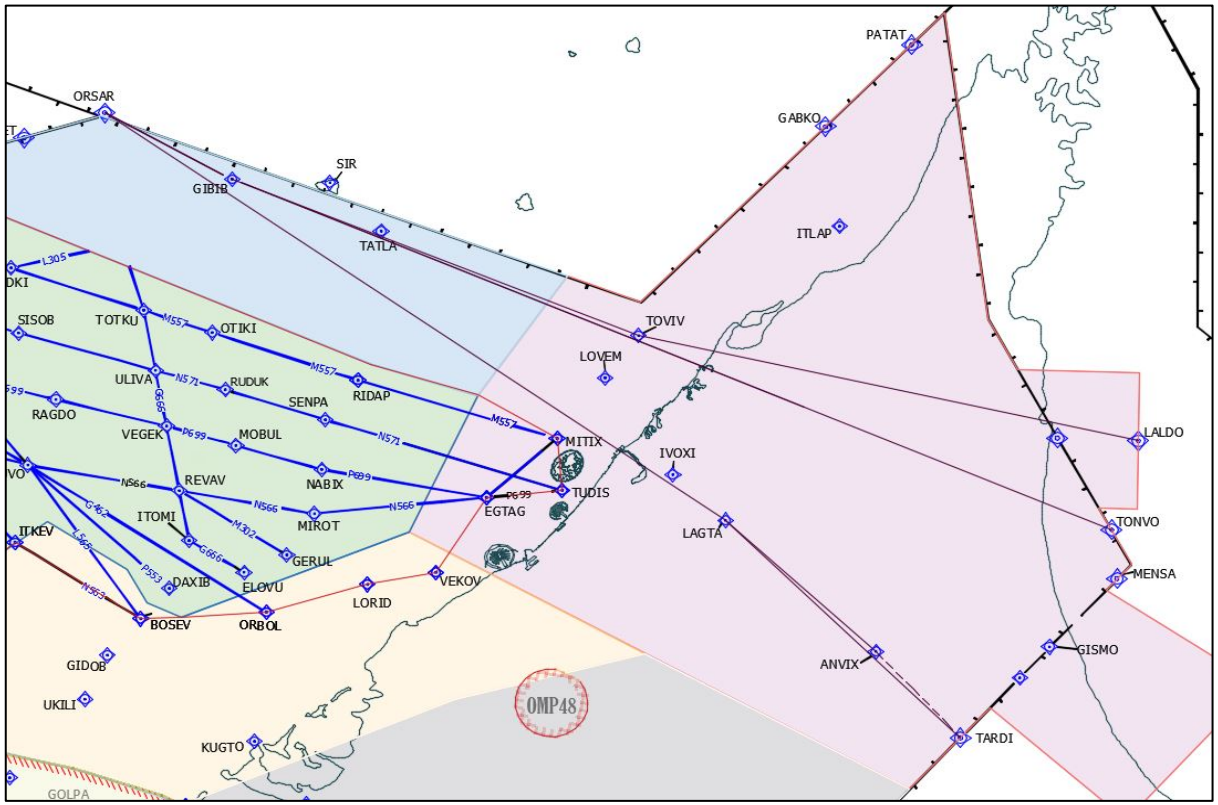
Emirates FRA Phase 1

After addressing various challenges and making necessary route adjustments, the airspace design team in collaboration with ATC , identified 62 direct (DCT) possibilities out of the initial 68. The next slides will illustrate some examples



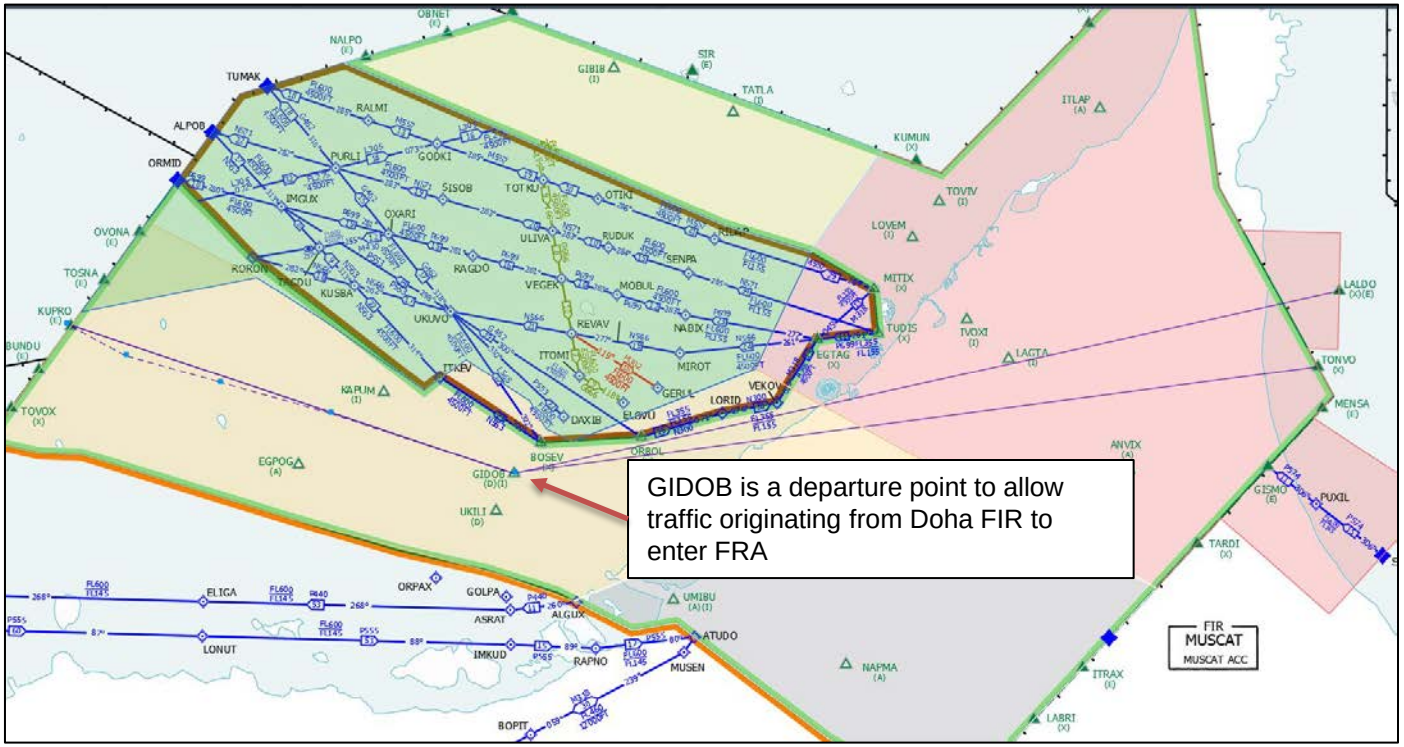
FRA Eastbound

Traffic at ORSAR



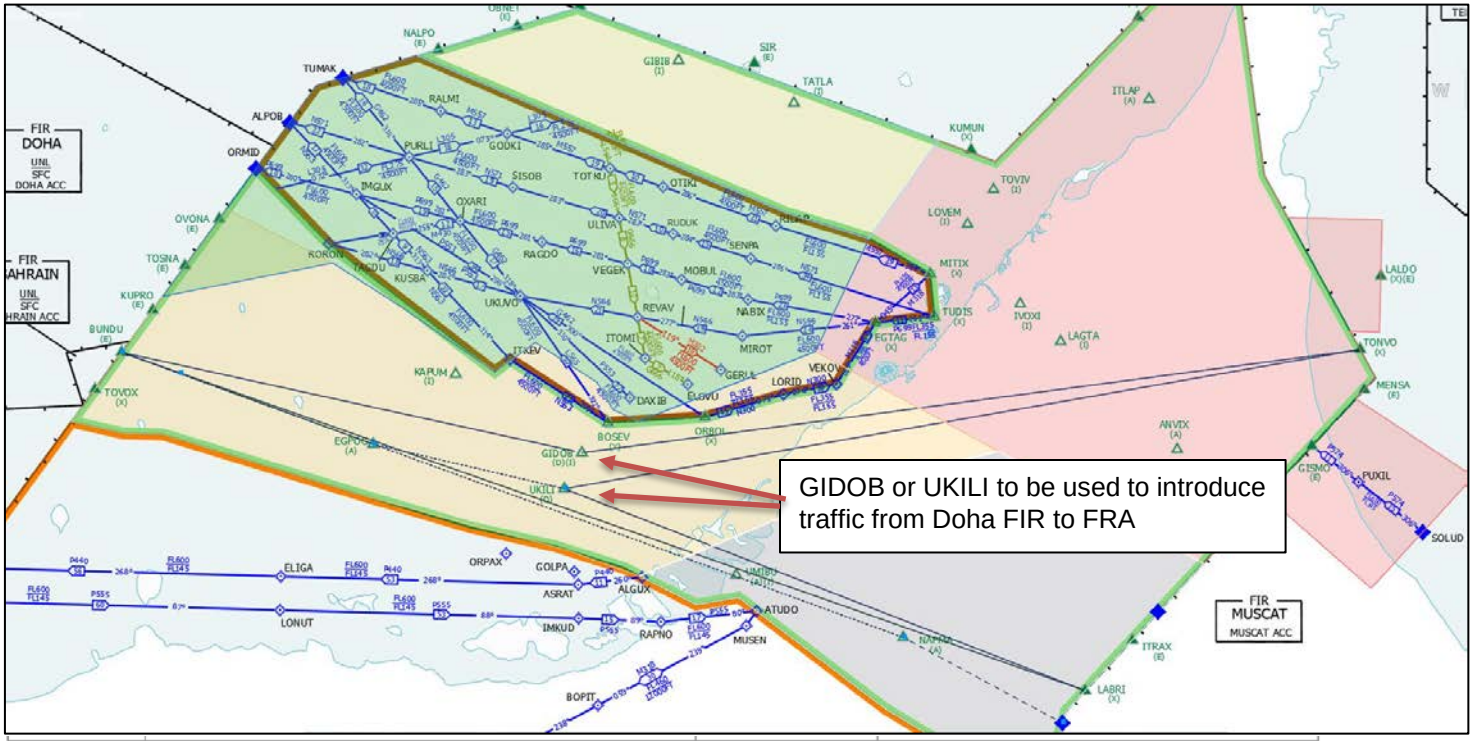
ORSAR	DCT GIBIB DCT	TONVO	(see Note 8)
	DCT GIBIB DCT TOVIV DCT	LALDO	(see Note 7)
	DCT LAGTA DCT	TARDI	
	DCT LAGTA DCT ANVIX L223	TARDI	Exits FRA at ANVIX (see Note 3)

Traffic at KUPRO



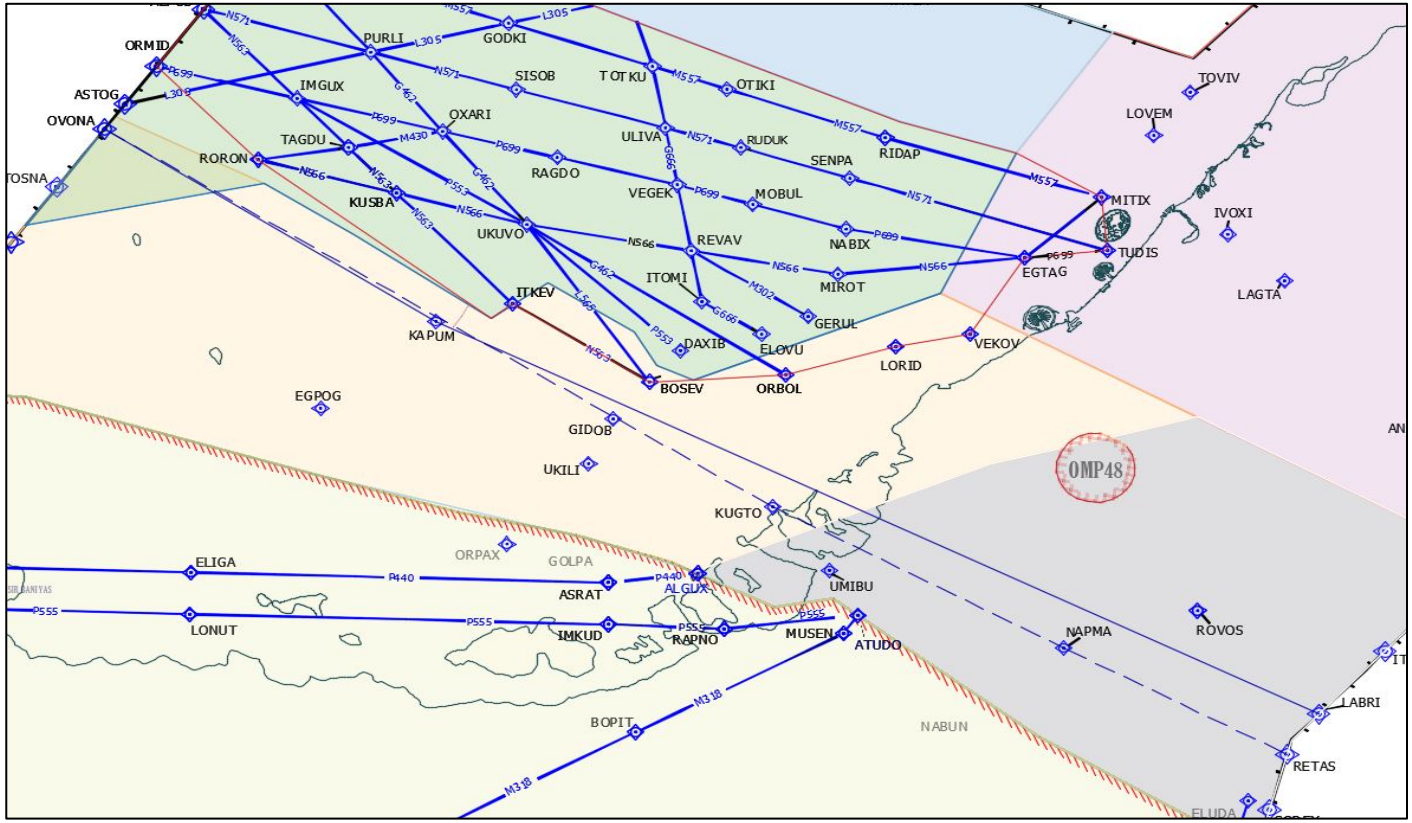
KUPRO	DCT GIDOB DCT	TONVO	
	N300 GIDOB DCT	TONVO	Enters FRA at GIDOB (see Note 2)
	N300 GIDOB DCT	LALDO	Enters FRA at GIDOB (see Note 2)
	DCT GIDOB DCT	LALDO	

Traffic at BUNDU



BUNDU	DCT	LABRI	(see Note 8)
	B415 UKILI DCT	LABRI	Enters FRA at UKILI (see Note 2 and 8)
	DCT GIDOB DCT	TONVO	
	B415 UKILI DCT	TONVO	Enters FRA at UKILI (see Note 2)
	DCT NAPMA N685	RETAS	Exits FRA at NAPMA (see Note 9)
	DCT EGPOG Q666 GIDOB DCT ADV DCT KANIP	OMAL	Exits FRA at EGPOG
	DCT EGPOG Q666 GIDOB	OMAD	Exits FRA at EGPOG
	DCT EGPOG B415 UKILI	OMAA	Exits FRA at EGPOG

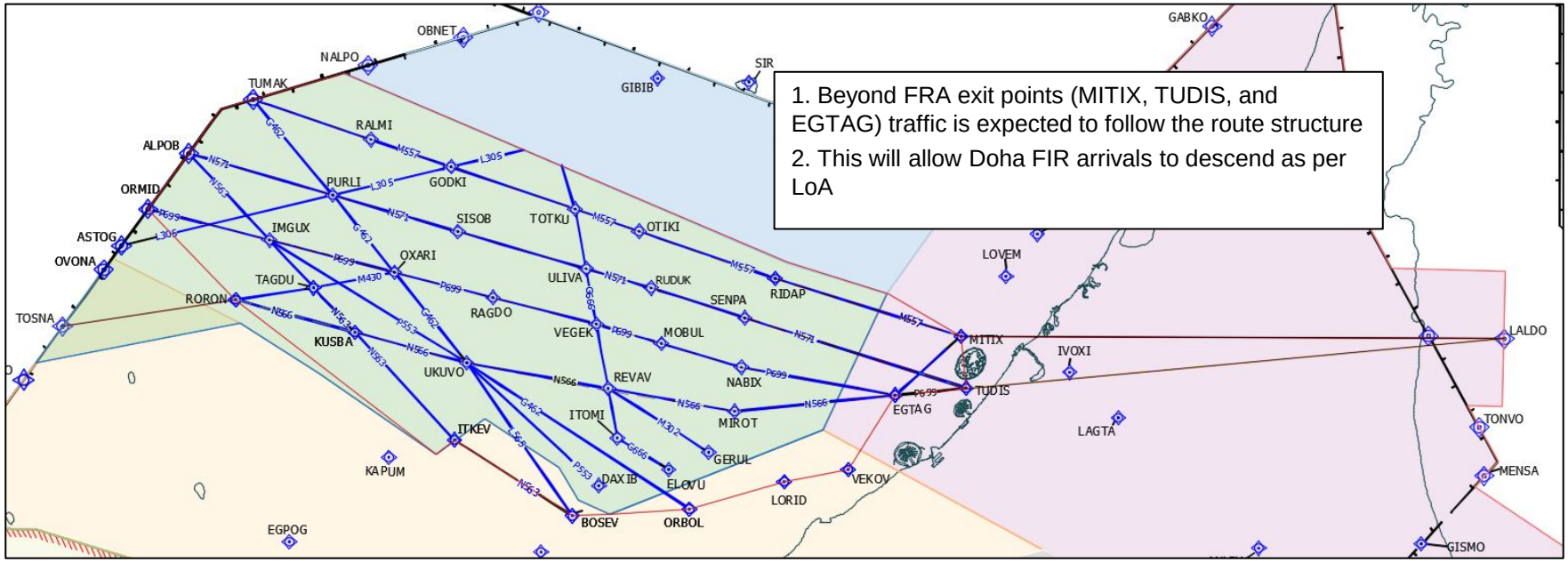
Traffic at OVONA



OVONA	DCT KAPUM DCT	LABRI	(see Note 8)
	DCT NAPMA N685	RETAS	Exits FRA at NAPMA (see Note 9)

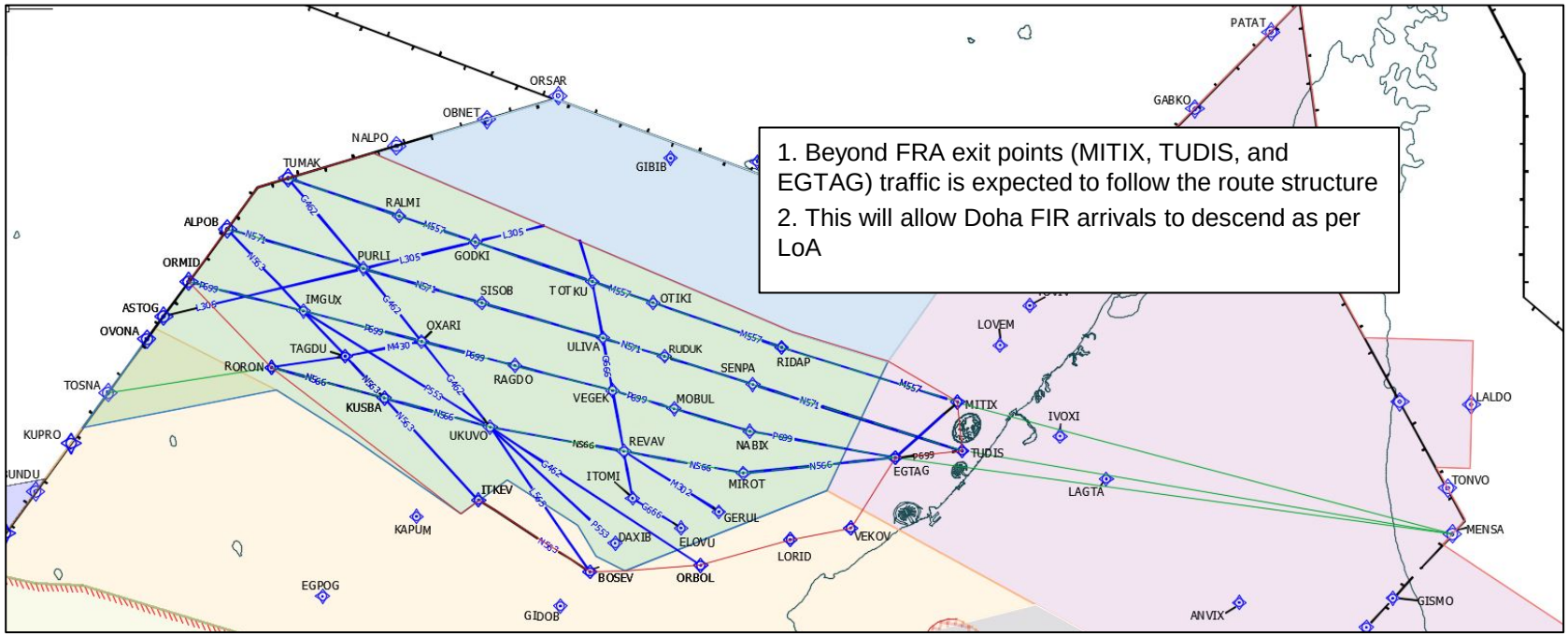
FRA Westbound

Traffic at LALDO

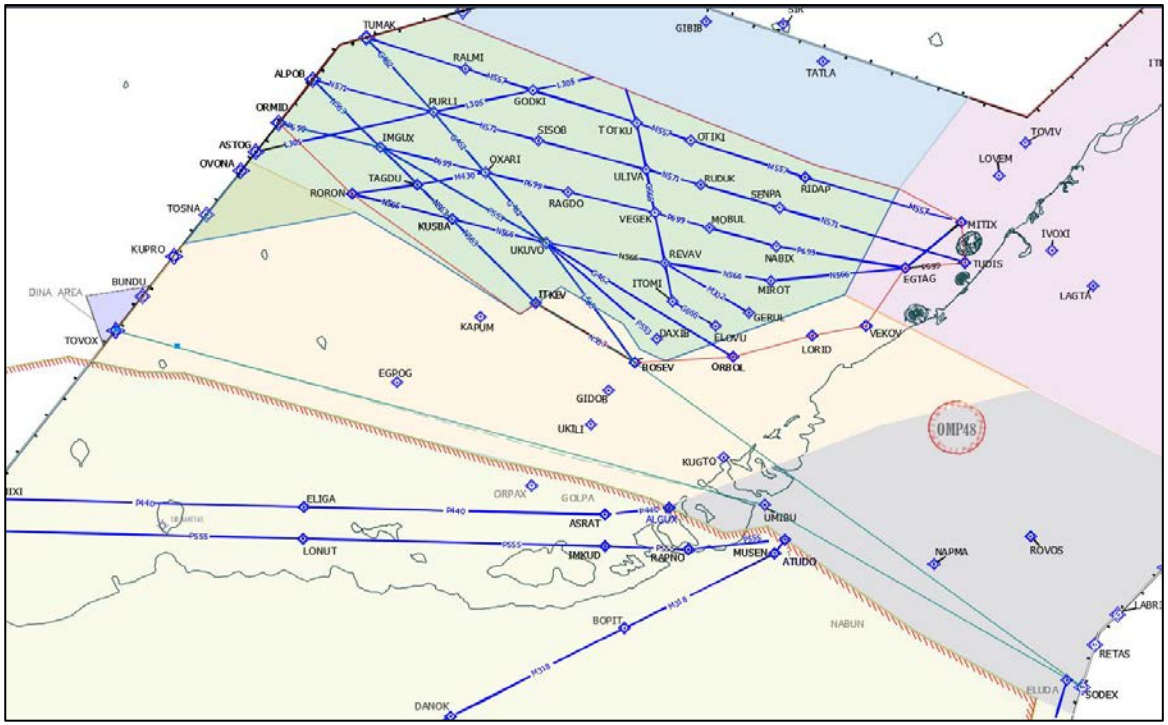


LALDO	DCT MITIX M557	TUMAK	Exits FRA at MITIX (see Note 4)
	DCT TUDIS N571	ALPOB	Exits FRA at TUDIS (see Note 5)
	DCT EGTAG P699	ORMID	Exits FRA at EGTAG (see Note 6)
	DCT EGTAG N566 RORON M430	TOSNA	Exits FRA at EGTAG

Traffic at MENSA



Traffic at SODEX



SODEX	DCT BOSEV N563	ALPOB	Exits FRA at BOSEV (see Note 5)
	DCT BOSEV L565 UKUVO G462	TUMAK	Exits FRA at BOSEV (see Note 4)
	DCT BOSEV N563 IMGUX P699	ORMID	Exits FRA at BOSEV (see Note 6)
	DCT UMIBU DCT	TOVOX	
	DCT UMIBU P899	TOVOX	Exits FRA UMIBU (see Note 1)

Important UAE AIP Sections

These are FRA concerned section within the UAE AIP which might be benefit for users:

1. **ENR 1.9 Air Traffic Flow Management and Airspace Management**
2. **ENR 1.10 FLIGHT PLANNING**
3. **ENR 2.2.5 Free Route Airspace (FRA)**
4. **ENR 3.3 Area navigation (RNAV) routes**
5. **ENR 4.4 NAME CODE DESIGNATORS FOR SIGNIFICANT POINTS**
6. **ENR 6.1 Free Route Airspace (Chart ENR 6-1)**
7. **ENR 6-3 En-Route chart - EMIRATES FIR (Chart ENR 6-3)**

Stakeholder Benefit Sample (Case Study)

DEP-DES	FRA IN Emirates FIR (FL350)+	FUEL SAVINGS	TOTAL SAVINGS
VOHS-OTHH	DCT EGTAG N566 RORON M430 TOSNA	15KGS APPROX/FLIGHT	45KGS
VABB-OTHH	DCT EGTAG N566 RORON M430 TOSNA	15KGS APPROX/FLIGHT	30KGS
OTHH-VOKN	B415 UKILI DCT LABRI	10KGS APPROX/FLIGHT	10KGS
OTHH-VOCI	B415 UKILI DCT LABRI	10KGS APPROX/FLIGHT	10KGS
OTHH-VOHS	B415 UKILI DCT LABRI	10KGS APPROX/FLIGHT	30KGS
OTHH-VABB	N300 GIDOB DCT TONVO	20KGS APPROX/FLIGHT	40KGS
OTHH-VOMM	B415 UKILI DCT LABRI	15KGS APPROX/FLIGHT	15KGS
OTHH-VOBL	B415 UKILI DCT LABRI	15KGS APPROX/FLIGHT	15KGS
VAAH-OKBK	DCT MITIX M557 TUMAK	80KGS APPROX/FLIGHT	80KGS
OKBK-VABB	DCT TONVO	12KGS APPROX/FLIGHT	12KGS
OKBK-VOMM	DCT KAPUM DCT LABRI	15KGS APPROX/FLIGHT	15KGS
OKBK-VOCI	DCT KAPUM DCT LABRI	15KGS APPROX/FLIGHT	15KGS
OKBK-VAAH	DCT TONVO	12KGS APPROX/FLIGHT	12KGS
VABB-OBBI	DCT EGTAG P699 ORMID	115KGS/FLIGHT	115KGS
VABB-OKBK	DCT MITIX M557 TUMAK	120KGS/FLIGHT	120KGS

This airline operates **7665 flight/year** in the Emirates FIR

With **564 kg/day** saving in fuel this accumulates to **205,860 kg/year**

∴ This airline would save > **USD 96,000/year**

* Calculations of fuel based on EUROCONTROL Standard Inputs for Economic Analyses – Edition 9 – December 2020

Potential Benefit for operators (Fast-time Simulation)

- **Benefit of FRA is visible on the long-term accumulative run whether it's on the economy of the airspace users, routes network, & the environment**

150 Flights/day → > 30 Million KG of fuel Saved

Savings exceed AED 50 Millions

Conclusion

- **This is an initial implementation which will be followed by an improved and enhanced publication**
  - Lower FRA level
  - Inclusion of more airspace

- **Optimum benefit when other ANSPs implement FRA**

- **Invitation to MID States to benefit from UAE's experience in implementing FRA**

- **Inviting interested States for active collaboration for their future FRA endeavours**

Thank You