الهيئة العامة للطيران المدني
GENERAL CIVIL AVIATION AUTHORITY

United Arab Emirates

Free Route Airspace (FRA) Implementation in UAE Airspace

Name
Position
Date

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2. Benefits of Free Route Airspace (FRA)
3. Key Components of FRA
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    - Information Publication
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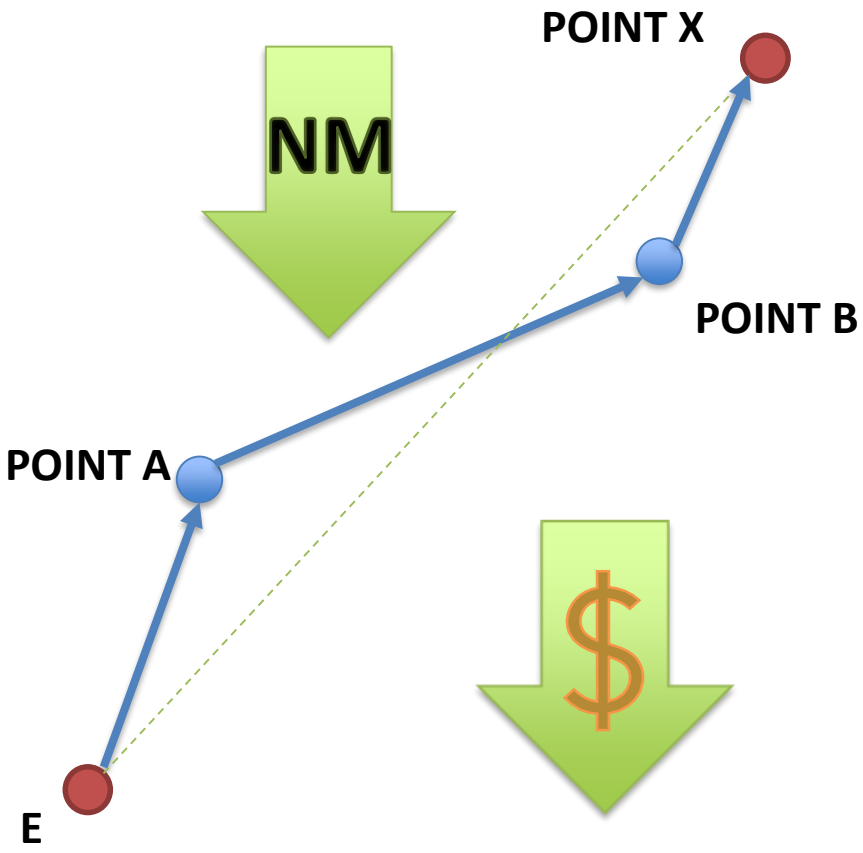
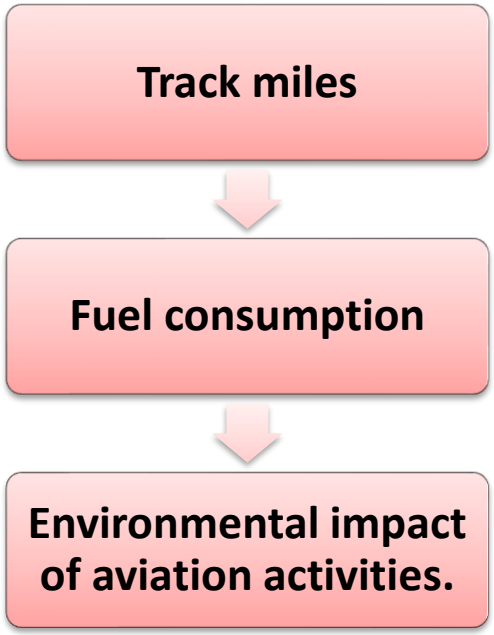
Introduction to Free Route Airspace (FRA)

•**Definition:** Free Route Airspace is an airspace where aircraft operators can freely plan and execute their flight routes between defined entry and exit points without following the traditional air traffic service (ATS) route network. This allows for greater flexibility and optimization based on the needs of the airline, prevailing weather conditions, air traffic volume, and other operational considerations.



Purpose and Benefits:

The primary goal of implementing FRA is to enhance flight efficiency by providing:



•FRA contributes to operational efficiency by allowing for more flexible route planning and reducing air traffic complexity.

Benefits of Free Route Airspace (FRA)

Enhanced Airspace Utilization and Safety:

- Distribute traffic

Environmental Impact:

- Reduction in CO2 emissions

Benefits of Free Route Airspace (FRA)

Economic Benefits

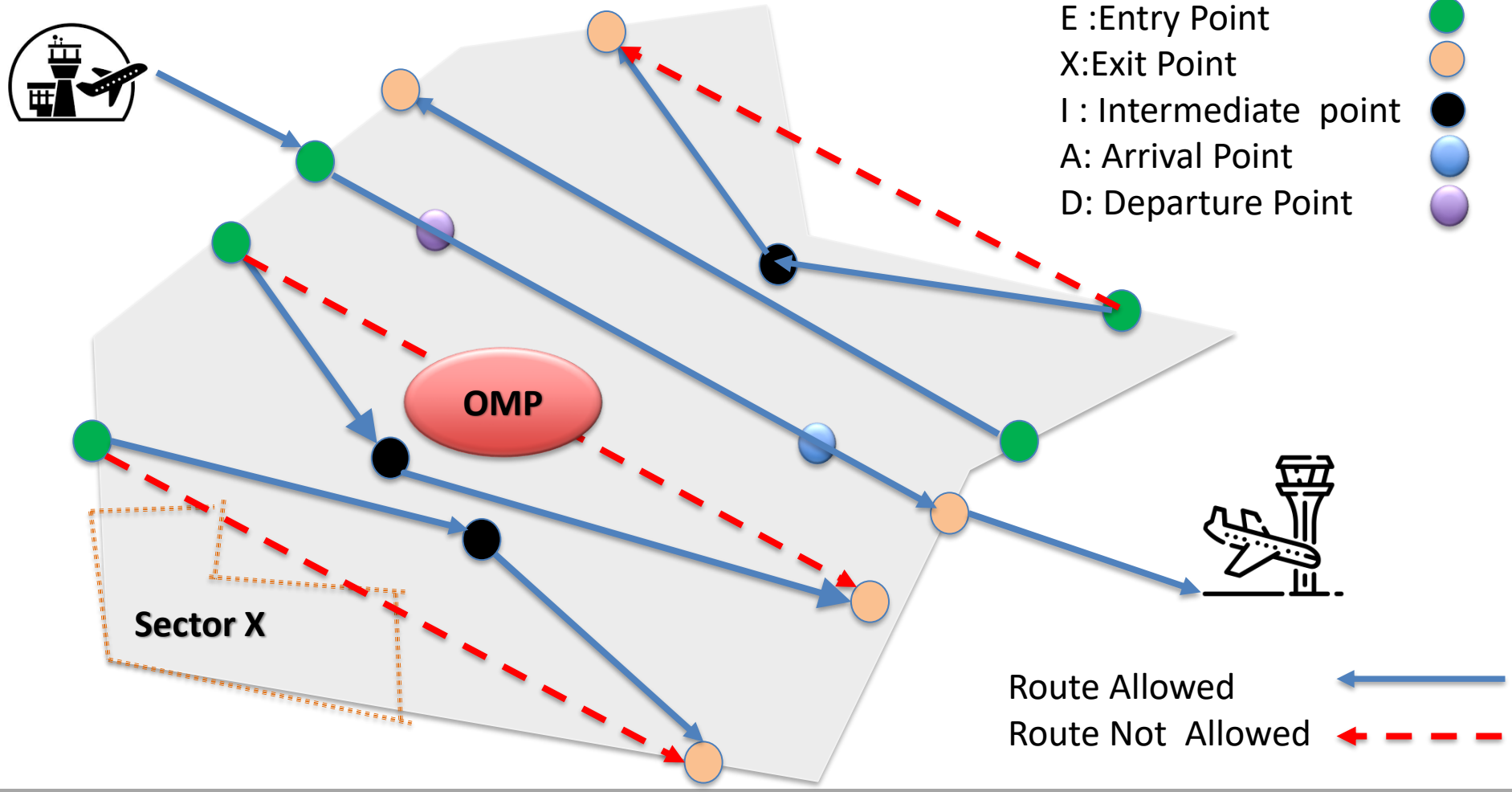
ANSPs

- Premium services

Airlines:

- **Operational cost-efficiency**

Key Components of FRA



Types of FRA Implementation (when)

- **Time-Limited Implementation:**
  - Implemented during specific periods, such as night time or off-peak hours, when traffic is lighter. This phased approach helps to minimize safety risks and allows for gradual adaptation to FRA.
  - **Advantages:** Facilitates initial testing and fine-tuning of FRA procedures with minimal disruption to regular air traffic operations. Helps in gathering data and feedback to improve the system before full-scale implementation.
- **No Time Limit Implementation:**
  - Typically used for airspace with consistent traffic volume throughout the day (24-hour operations).

- **UAE's FRA Strategy**
  - *24-hour operations implemented.*

Types of FRA Implementation (where)

- **Structurally or Geographically Limited Implementation:**
  - In complex or congested airspaces, FRA may be introduced with certain structural or geographical limitations. For example, FRA might be restricted to specific Control Areas (CTAs) or applied only in upper airspace where traffic density is lower.
  - **Purpose:** This method ensures that FRA can be implemented in stages without overwhelming the existing air traffic management system, allowing for adjustments based on operational feedback and observed traffic patterns.

- **UAE's FRA Strategy**
  - *FRA starts from Flight Level 355 and above.*

Types of FRA Implementation (what)

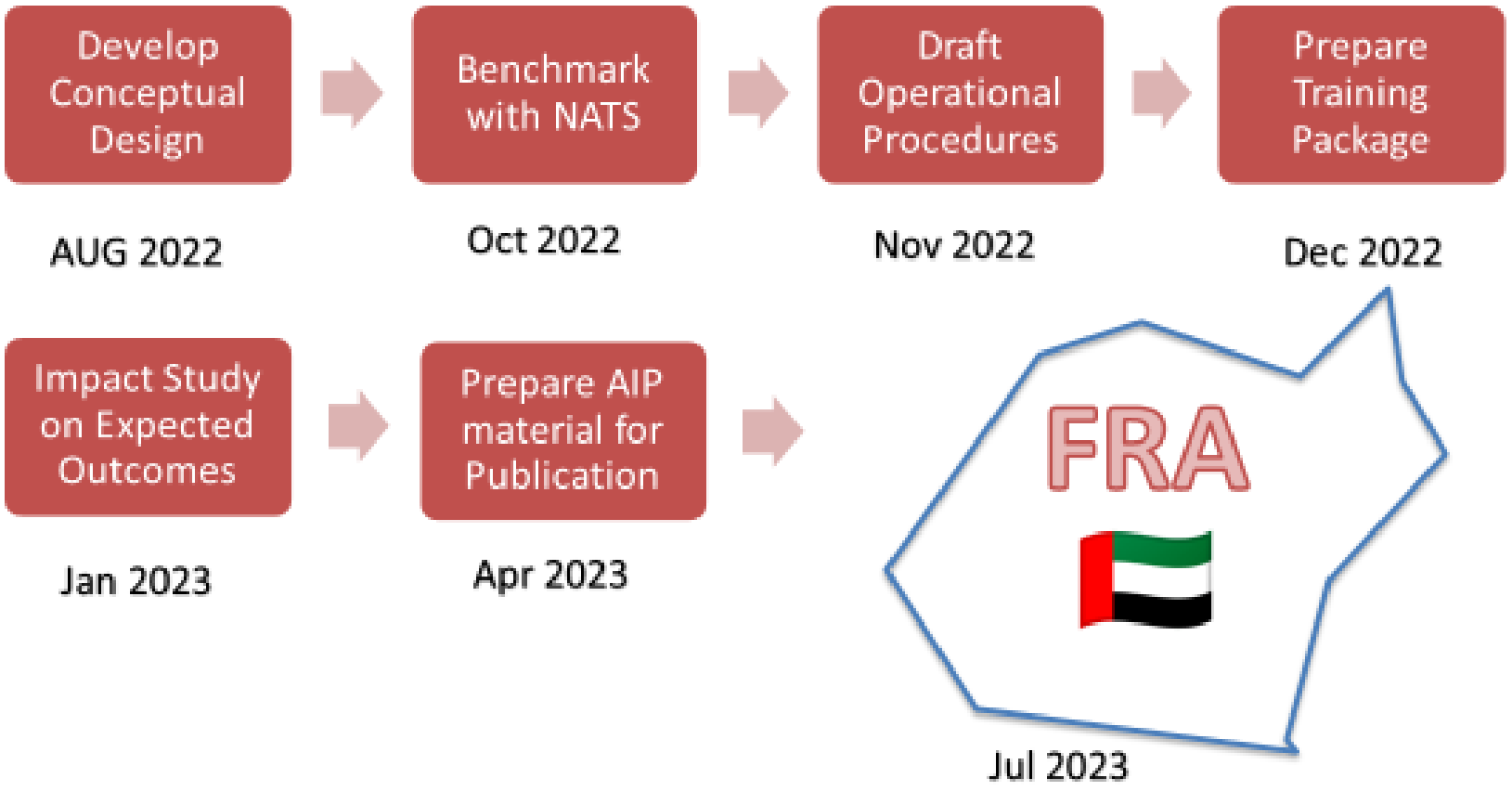
- **Direct Route Airspace (DRA):**
  DRA is a form of airspace where direct routing is allowed, taking into account traffic flows and potentially applying limitations such as specific time periods, flight levels, or designated airspace blocks.
- **Direct Routing Operations (DRO):**
  DRO is a step towards full FRA implementation and involves allowing direct routes between specific waypoints. It can be implemented in two phases:
  1. **Tactical Phase:** Involves real-time routing provided by air traffic controllers to reduce flight distances or traffic complexity. These routes are not pre-plannable and depend on real-time conditions.
  2. **Flight-Plannable Phase:** Allows predictable direct routings to be pre-planned for different phases of flight (cruise, climb, descent). This phase supports the gradual move to full FRA and can be applied across FIRs, even in complex environments, if coordinated with adjacent FIRs.

Types of FRA Implementation (what)

- **Free Route Airspace (FRA):**
  Free Route operations allow aircraft to plan and fly routes as close as possible to their preferred paths without being restricted by fixed airspace structures or routes. In an FRA environment, flights can navigate freely between defined entry and exit points, potentially including intermediate waypoints, while still under air traffic control supervision.
- **Adapted FRA Concept:**
  Tailored the FRA concept to meet operational needs and accommodate the specific characteristics and restrictions of the Emirates FIR.
- *In summary, DRO and DRA serve as preliminary steps to gather data, understand airspace complexities, and prepare ANSPs (Air Navigation Service Providers) for the full implementation of FRA).*

- **UAE's FRA Strategy**
  - *FRA with specific entry, exit, and intermediate points to manage airspace complexity and safety.*

FRA Road Map


Develop Conceptual Design
Benchmark with NATS
Draft Operational Procedures
Prepare Training Package
AUG 2022
Oct 2022
Nov 2022
Dec 2022
Impact Study on Expected Outcomes
Prepare AIP material for Publication
FRA
Jan 2023
Apr 2023
Jul 2023

KPI's

- **Operational Efficiency:**
  - **Target:** Achieve 100% readiness of operational staff to manage FRA.
  - **Achievement:** Full readiness achieved with comprehensive training programs completed for all relevant staff.
- **Fuel Consumption Reduction:**
  - **Target:** Achieve a 3% reduction in annual fuel consumption for flights using FRA compared to the same period in the previous year on normal route structures.
  - **Achievement:** A 3.2% reduction in fuel consumption was recorded, exceeding initial targets.

KPI's

- **CO2 Emissions Reduction:**
  - **Target:** Achieve a 2.5% reduction in CO2 emissions for FRA flights compared to flights using normal route structures.
  - **Achievement:** A 2.7% reduction in CO2 emissions was achieved, contributing to global sustainability efforts.
- **Shortened Flight Distance:**
  - **Target:** Reduce flight distances by 2.5% for FRA flights compared to traditional routes.
  - **Achievement:** Successfully achieved through optimized routing and strategic use of FRA entry and exit points.

Challenges and Considerations

Challenges	Mitigations
Engagement and Testing: Continuous engagement with flight plan data providers and airlines is essential to ensure a smooth transition to FRA.	Extensive testing to validate procedures, identify gaps, and conduct surveys with airspace users.
System Upgrades: Implementing FRA may require advanced systems such as Medium-Term Conflict Detection (MTCD) in certain areas of the airspace different than others and enhanced flight-planning management	- Consult ATM system supplier with specific needs - Provision of adaptation methods to manage FRA environment - Close coordination with flight-planning management providers such as Lido & Jeppesen
Sectorization Needs: Current sector boundaries require restructuring to support full FRA.	Introduce intermediate points to avoid sector infringements.

Challenges and Considerations

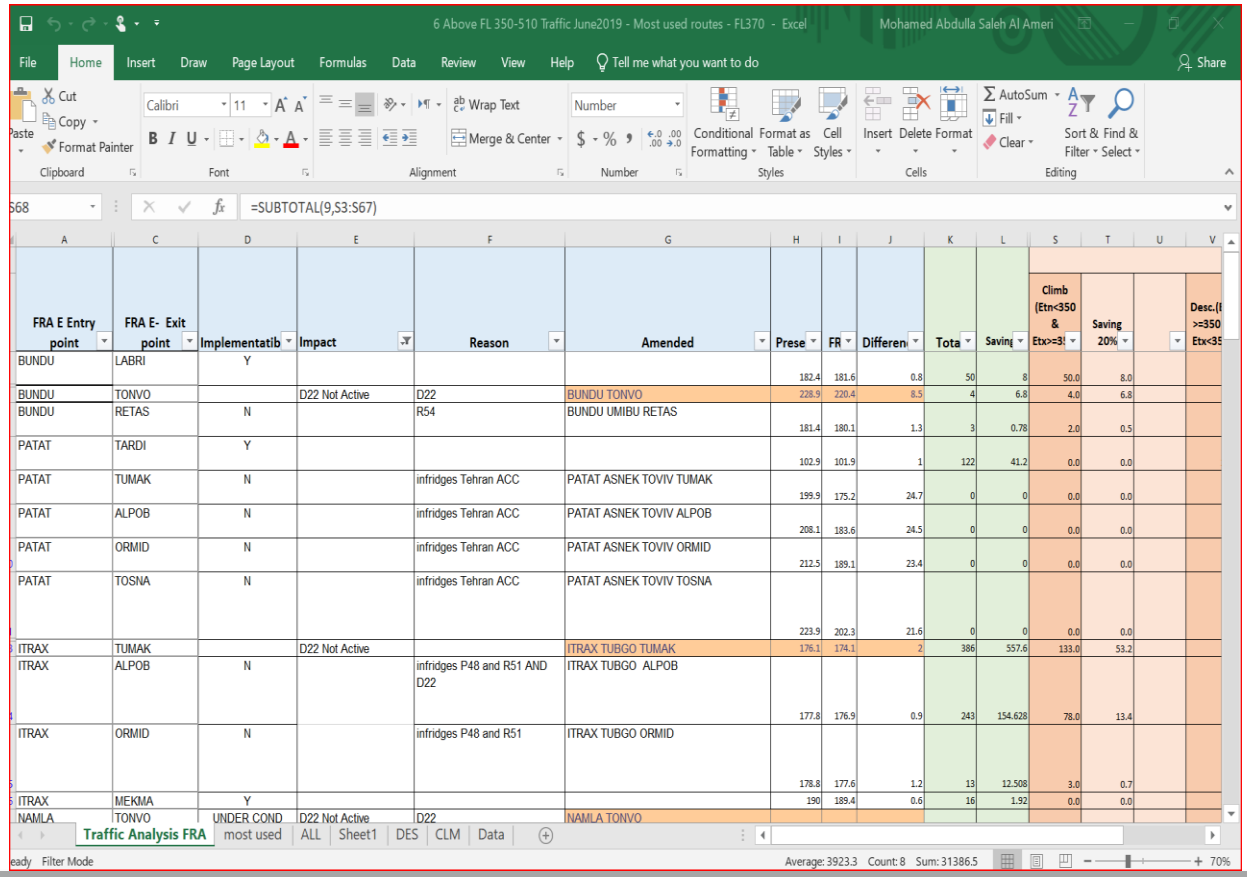
Challenges	Mitigations
Coordination Challenges: Neighboring FIRs may not have FRA, requiring structured coordination.	Use the same exit and entry points for FRA as the current points for adjacent FIRs, starting FRA after the delegated area of responsibilities.
Civil/Military Coordination: Restricted and prohibited areas (e.g., OMR54, OMP48) necessitate controlled routing to avoid conflicts.	Lower all OMR, OMP, and OMD areas below the FRA level, except for OMR54 and OMP48.
Existing Letters of Agreement (LoA) • **Considering requirements published by neighbouring ANSP's in regards to use of certain routes/waypoint for certain destinations**	keep these rules in force
Other	Keep the same 5 letters code to be used as (E) ,(X),(I) ,(D) and (A)

Stage 1: Development of Conceptual Design (20%)

- **Timeline: 1st August 2022 – 30th September 2022**
  - **Tasks:**
    - Avoid infringing on other sectors or restricted areas such as OMD, OMR, OMP, or adjacent FIRs.
    - Avoid OMP,OMR,OMD Area's
    - Minimize changes to current procedures.
    - Utilize data from R&D on climb trajectories.
    - Study and determine the most suitable flight level for the transition between FRA and non-FRA
    - Fast time sim
  - **Outcome:** A fully developed conceptual design for FRA, ready for further development and implementation.
    - Maintain arrival levels below the FRA to avoid amendments to Letters of Agreement (LoA) with other ATC units.

Planning and Design

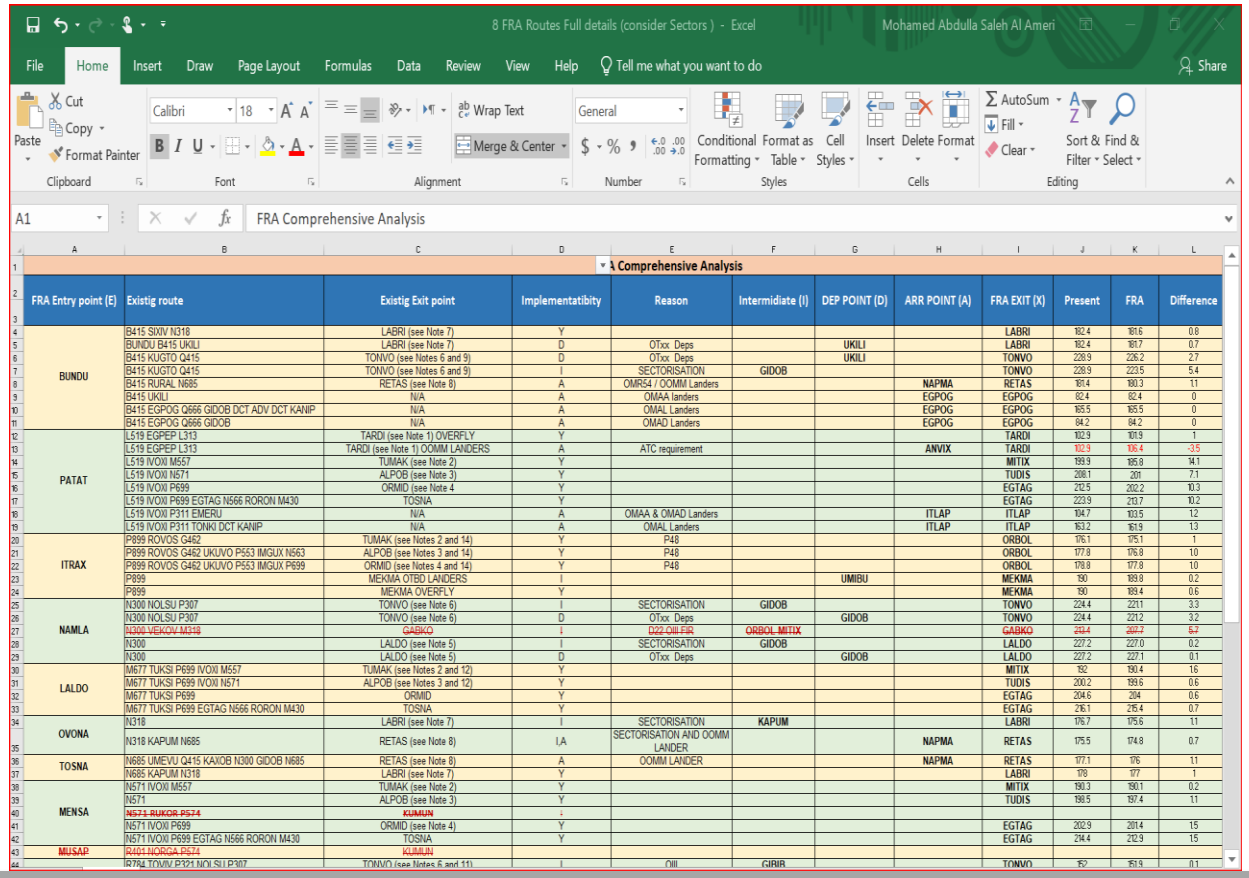
- Analysis matrix with NM measurements to analyse the impact before and after the changes



FRA E Entry point	FRA E- Exit point	Implementatib	Impact	Reason	Amended	Prese	FR	Differen	Tota	Saving	Climb (Etn<350 & Etx>=3	Saving 20%	Desc.(I >=350 Etx<35
BUNDU	LABRI	Y				182.4	181.6	0.8	50	8	50.0	8.0	
BUNDU	TONVO		D22 Not Active	D22	BUNDU TONVO	228.9	220.4	8.5	4	6.8	4.0	6.8	
BUNDU	RETAS	N		R54	BUNDU UMIBU RETAS	181.4	180.1	1.3	3	0.78	2.0	0.5	
PATAT	TARDI	Y				102.9	101.9	1	122	41.2	0.0	0.0	
PATAT	TUMAK	N		infridges Tehran ACC	PATAT ASNEK TOVIV TUMAK	199.9	175.2	24.7	0	0	0.0	0.0	
PATAT	ALPOB	N		infridges Tehran ACC	PATAT ASNEK TOVIV ALPOB	208.1	183.6	24.5	0	0	0.0	0.0	
PATAT	ORMID	N		infridges Tehran ACC	PATAT ASNEK TOVIV ORMID	212.5	189.1	23.4	0	0	0.0	0.0	
PATAT	TOSNA	N		infridges Tehran ACC	PATAT ASNEK TOVIV TOSNA	223.9	202.3	21.6	0	0	0.0	0.0	
ITRAX	TUMAK		D22 Not Active		ITRAX TUBGO TUMAK	176.1	174.1	2	386	557.6	133.0	53.2	
ITRAX	ALPOB	N		infridges P48 and R51 AND D22	ITRAX TUBGO ALPOB	177.8	176.9	0.9	243	154.628	78.0	13.4	
ITRAX	ORMID	N		infridges P48 and R51	ITRAX TUBGO ORMID	178.8	177.6	1.2	13	12.508	3.0	0.7	
ITRAX	MEKMA	Y				190	189.4	0.6	16	1.92	0.0	0.0	
NAMLA	TONVO	UNDER COND	D22 Not Active	D22	NAMLA TONVO								

Planning and Design

- Analysis matrix with NM measurements to analyse the impact before and after the changes (consider Sectors)



8 FRA Routes Full details (consider Sectors) - Excel — Mohamed Abdulla Saleh Al Ameri

File | Home | Insert | Draw | Page Layout | Formulas | Data | Review | View | Help | Tell me what you want to do | Share

Cut | Copy | Format Painter | Paste | Calibri | 18 | Wrap Text | General | Merge & Center | Conditional Formatting | Format as Table | Cell Styles | Insert | Delete | Format | AutoSum | Fill | Clear | Sort & Filter | Find & Select

Clipboard | Font | Alignment | Number | Styles | Cells | Editing

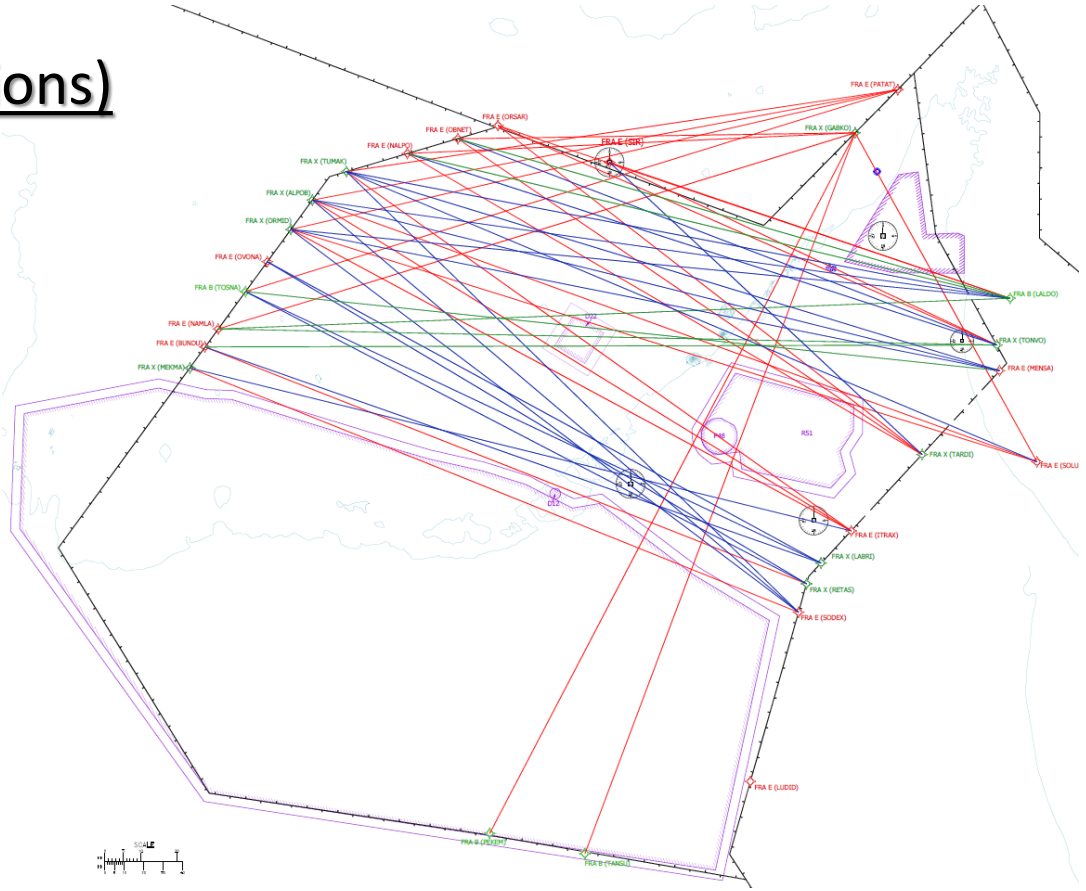
A1 | FRA Comprehensive Analysis

FRA Comprehensive Analysis

FRA Entry point (E)	Existig route	Existig Exit point	Implementatibity	Reason	Intermidiate (I)	DEP POINT (D)	ARR POINT (A)	FRA EXIT (X)	Present	FRA	Difference
BUNDU	B415 SIXIV N318	LABRI (see Note 7)	Y					LABRI	182.4	181.6	0.8
	BUNDU B415 UKILI	LABRI (see Note 7)	D	OTxx Deps		UKILI		LABRI	182.4	181.7	0.7
	B415 KUGTO Q415	TONVO (see Notes 6 and 9)	D	OTxx Deps		UKILI		TONVO	238.9	236.2	2.7
	B415 KUGTO Q415	TONVO (see Notes 6 and 9)	I	SECTORISATION	GIDOB			TONVO	238.9	223.5	5.4
	B415 RURAL N685	RETAS (see Note 8)	A	OMR54 / OOMM Landers			NAPMA	RETAS	181.4	180.3	1.1
	B415 UKILI	N/A	A	OMAA landers			EGPOG	EGPOG	82.4	82.4	0
	B415 EGPOG Q666 GIDOB DCT ADV DCT KANIP	N/A	A	OMAL Landers			EGPOG	EGPOG	165.5	165.5	0
	B415 EGPOG Q666 GIDOB	N/A	A	OMAD Landers			EGPOG	EGPOG	84.2	84.2	0
PATAT	L519 EGPEP L313	TARDI (see Note 1) OVERFLY	Y					TARDI	102.9	101.9	1
	L519 EGPEP L313	TARDI (see Note 1) OOMM LANDERS	A	ATC requirement			ANVIX	TARDI	102.9	106.4	-3.5
	L519 IVOXI M557	TUMAK (see Note 2)	Y					MITIX	189.9	185.8	4.1
	L519 IVOXI N571	ALPOB (see Note 3)	Y					TUDIS	208.1	201	7.1
	L519 IVOXI P699	ORMID (see Note 4	Y					EGTAG	212.5	202.2	10.3
	L519 IVOXI P699 EGTAG N566 RORON M430	TOSNA	Y					EGTAG	223.9	213.7	10.2
	L519 IVOXI P311 EMERU	N/A	A	OMAA & OMAD Landers			ITLAP	ITLAP	194.7	183.5	1.2
	L519 IVOXI P311 TONKI DCT KANIP	N/A	A	OMAL Landers			ITLAP	ITLAP	163.2	161.9	1.3
ITRAX	P899 ROVOS G452	TUMAK (see Notes 2 and 14)	Y	P48				ORBOL	176.1	175.1	1
	P899 ROVOS G452 UKUVO P553 IMGUX N563	ALPOB (see Notes 3 and 14)	Y	P48				ORBOL	177.8	176.8	1.0
	P899 ROVOS G452 UKUVO P553 IMGUX P699	ORMID (see Notes 4 and 14)	Y	P48				ORBOL	178.8	177.8	1.0
	P899	MEKMA OTBD LANDERS	I			UMIBU		MEKMA	190	189.8	0.2
	P899	MEKMA OVERFLY	Y					MEKMA	190	189.4	0.6
NAMLA	N300 NOLSU P307	TONVO (see Note 6)	I	SECTORISATION	GIDOB			TONVO	224.4	221.1	3.3
	N300 NOLSU P307	TONVO (see Note 6)	D	OTxx Deps		GIDOB		TONVO	224.4	221.2	3.2
	~~N300 VEKOV M318~~	~~GABKO~~	I	~~D22 OIII FIR~~	~~ORBOL MITIX~~			~~GABKO~~	~~233.4~~	~~227.7~~	~~5.7~~
	N300	LALDO (see Note 5)	I	SECTORISATION	GIDOB			LALDO	227.2	227.0	0.2
	N300	LALDO (see Note 5)	D	OTxx Deps		GIDOB		LALDO	227.2	227.1	0.1
LALDO	M677 TUKSI P699 IVOXI M557	TUMAK (see Notes 2 and 12)	Y					MITIX	192	190.4	1.6
	M677 TUKSI P699 IVOXI N571	ALPOB (see Notes 3 and 12)	Y					TUDIS	200.2	199.6	0.6
	M677 TUKSI P699	ORMID	Y					EGTAG	204.6	204	0.6
	M677 TUKSI P699 EGTAG N566 RORON M430	TOSNA	Y					EGTAG	216.1	215.4	0.7
OVONA	N318	LABRI (see Note 7)	I	SECTORISATION	KAPUM			LABRI	176.7	175.6	1.1
	N318 KAPUM N685	RETAS (see Note 8)	I,A	SECTORISATION AND OOMM LANDER			NAPMA	RETAS	175.5	174.8	0.7
TOSNA	N685 UMEVU Q415 KAXOB N300 GIDOB N685	RETAS (see Note 8)	A	OOMM LANDER			NAPMA	RETAS	177.1	176	1.1
	N685 KAPUM N318	LABRI (see Note 7)	Y					LABRI	178	177	1
MENSA	N571 IVOXI M557	TUMAK (see Note 2)	Y					MITIX	190.3	190.1	0.2
	N571	ALPOB (see Note 3)	Y					TUDIS	198.5	197.4	1.1
	~~N571 RUKOR P574~~	~~KUMUN~~	-								
	N571 IVOXI P699	ORMID (see Note 4)	Y					EGTAG	202.9	201.4	1.5
	N571 IVOXI P699 EGTAG N566 RORON M430	TOSNA	Y					EGTAG	214.4	212.9	1.5
~~MUSAP~~	~~R401 NORGA P574~~	~~KUMUN~~									
	R784 TOVIV P321 NOLSU P307	TONVO (see Notes 6 and 11)	I	OIII	GIBIR			TONVO	152	151.9	0.1

Planning and Design (concept design)

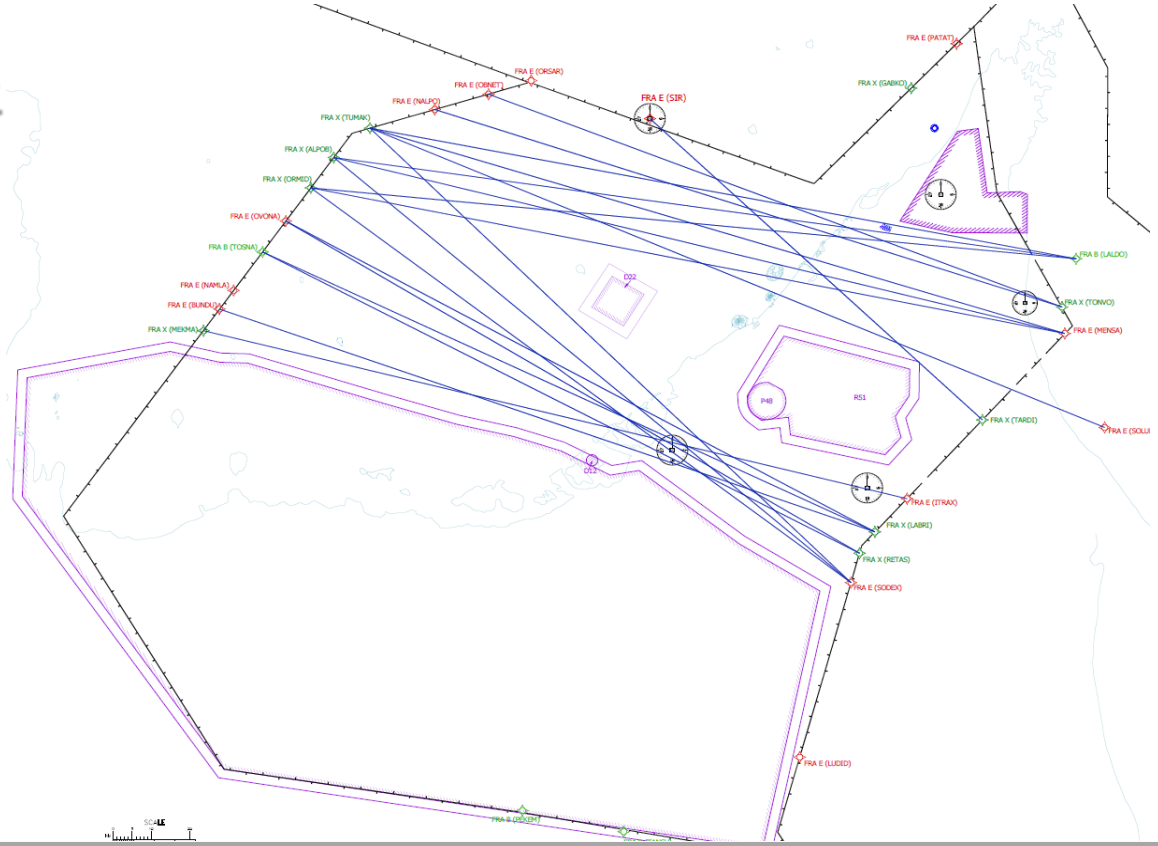
FRA(No restrictions)



Planning and Design (concept design)

Divide the trajectories due OMR,OMD,OMP and FIR infringing in to

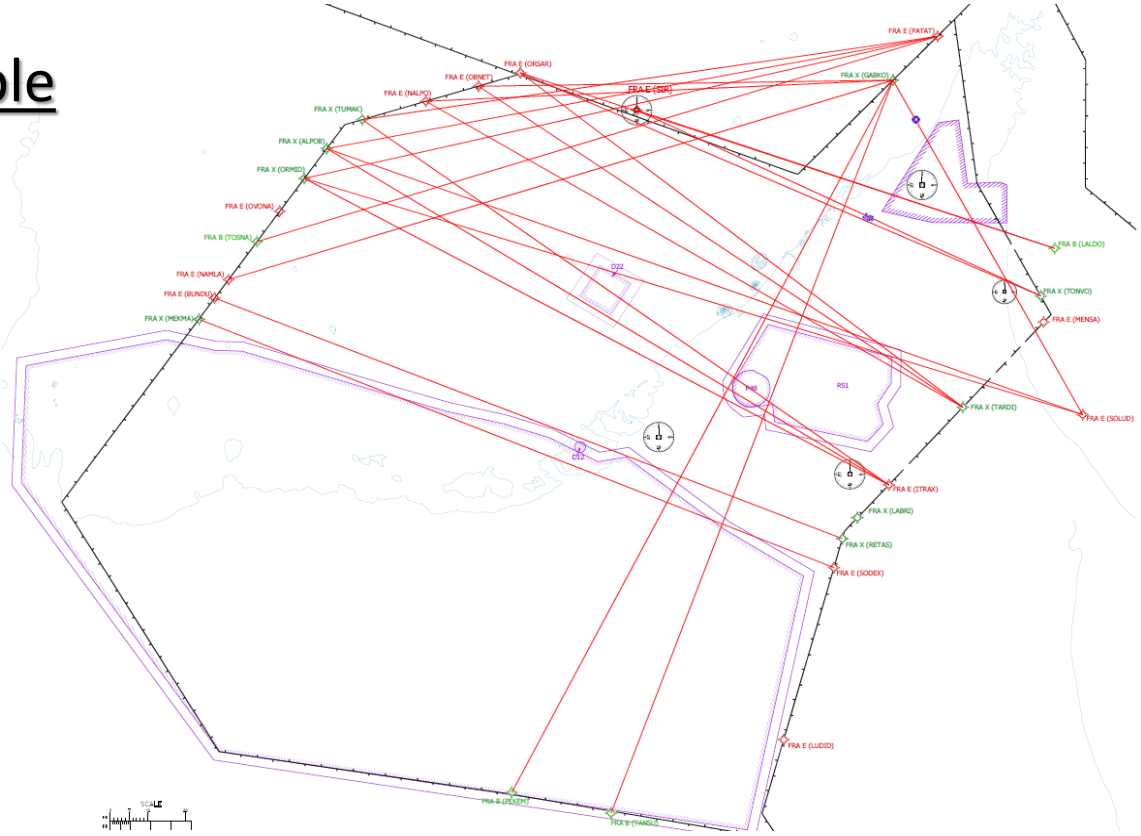
Implementable



Planning and Design (concept design)

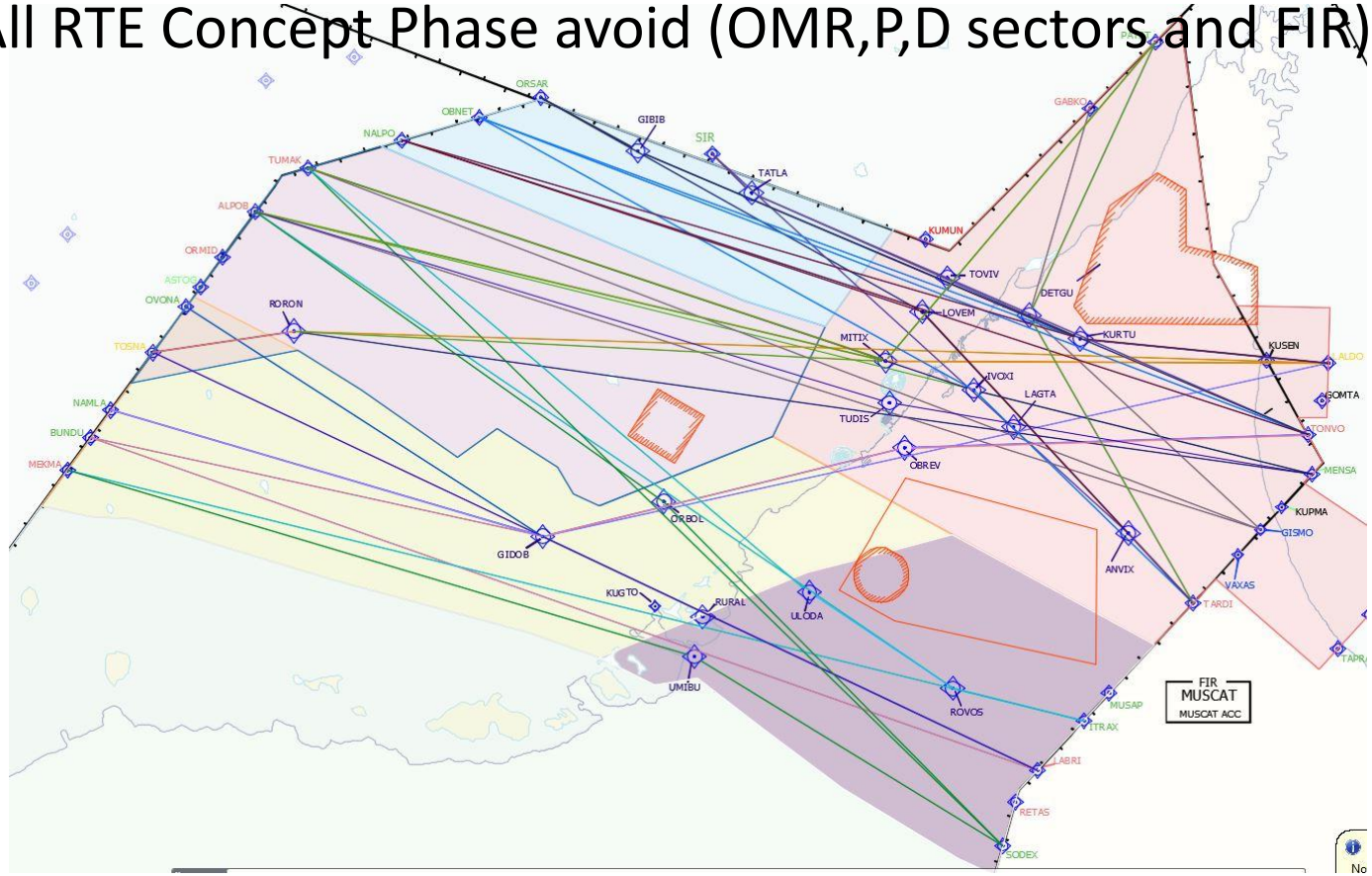
Divide the trajectories due OMR,OMD,OMP and FIR infringing in to

Non-implantable



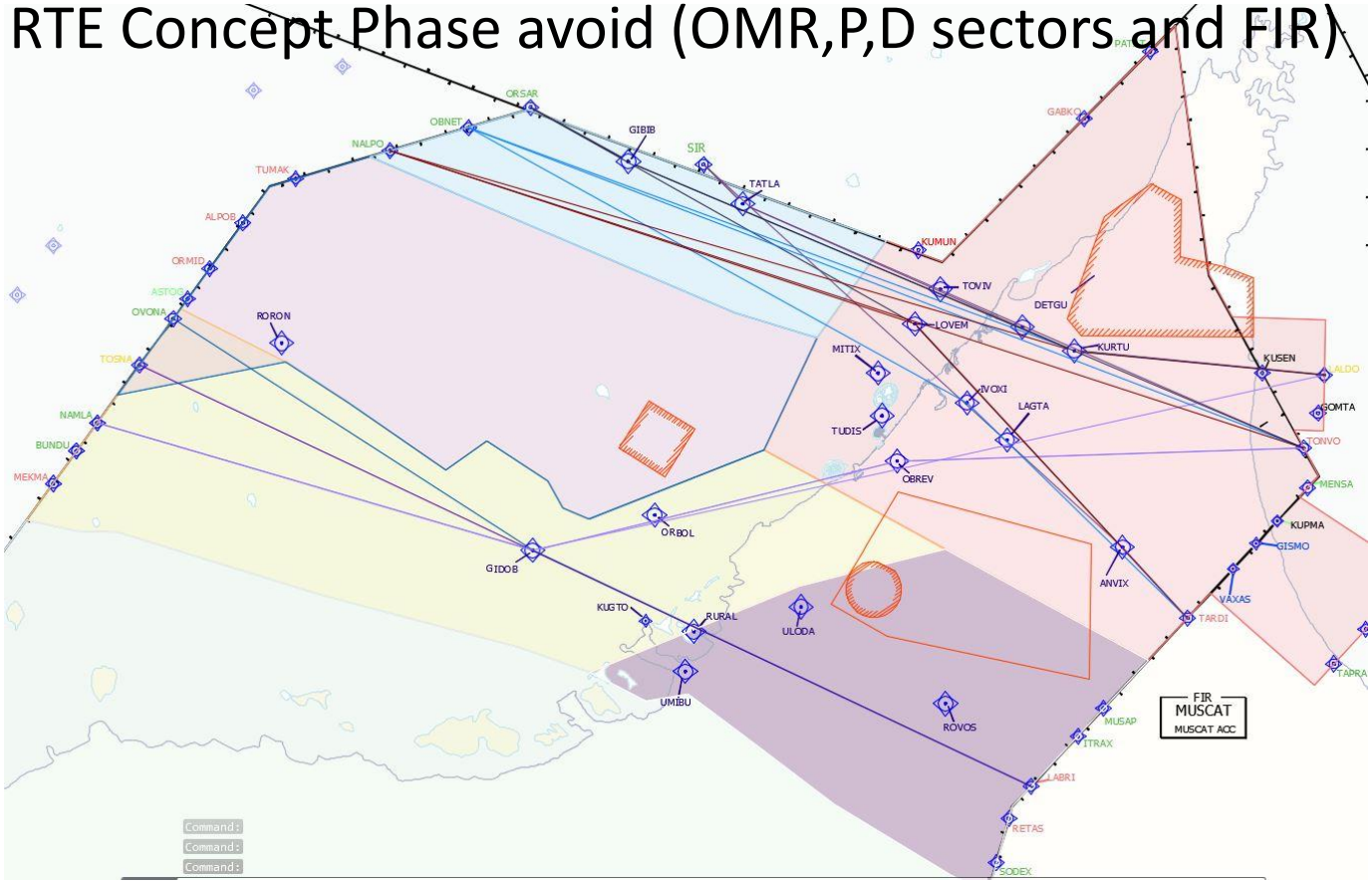
Planning and Design (concept design)

FRA All RTE Concept Phase avoid (OMR,P,D sectors and FIR)



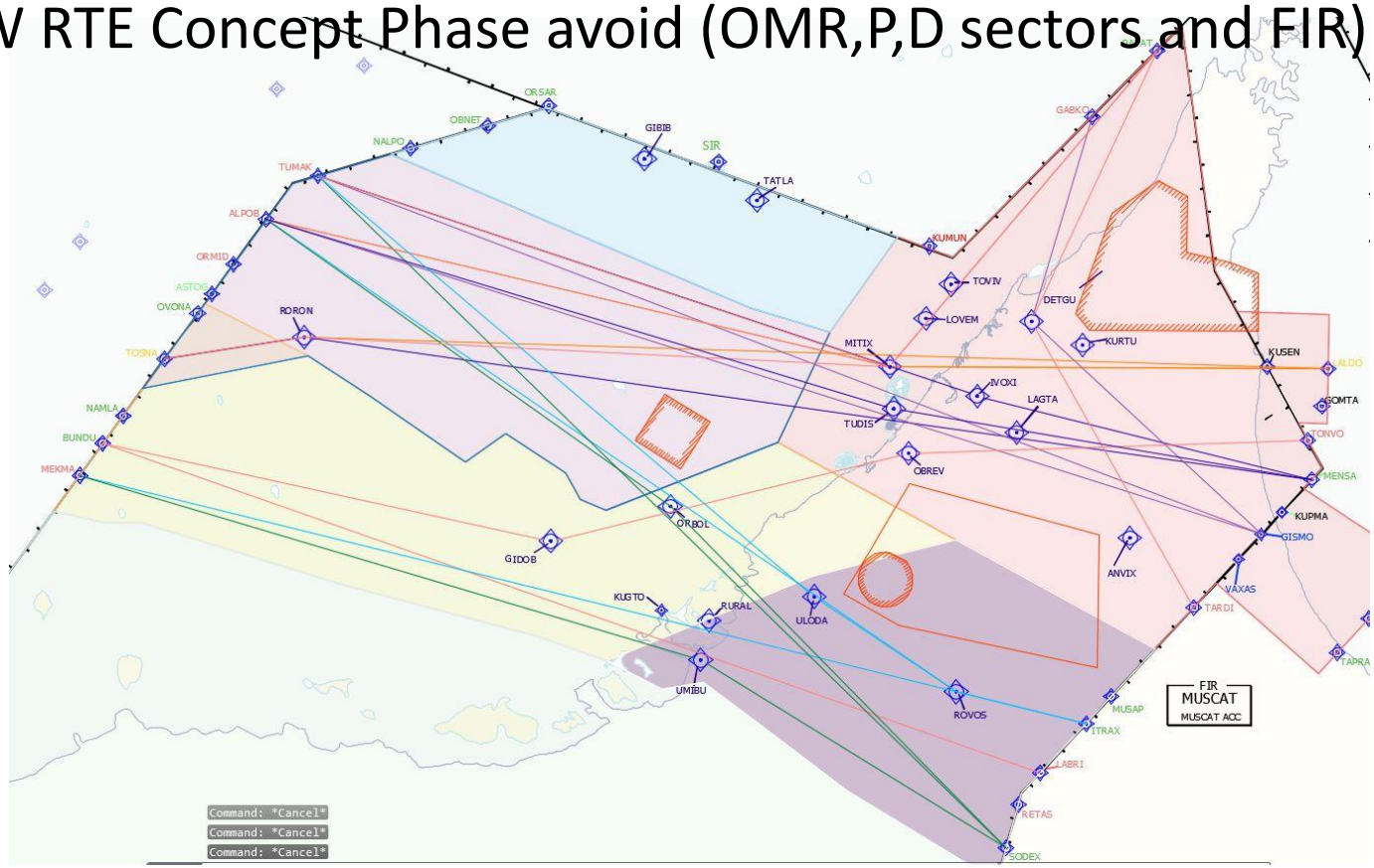
Planning and Design (concept design)

FRA E RTE Concept Phase avoid (OMR,P,D sectors and FIR)



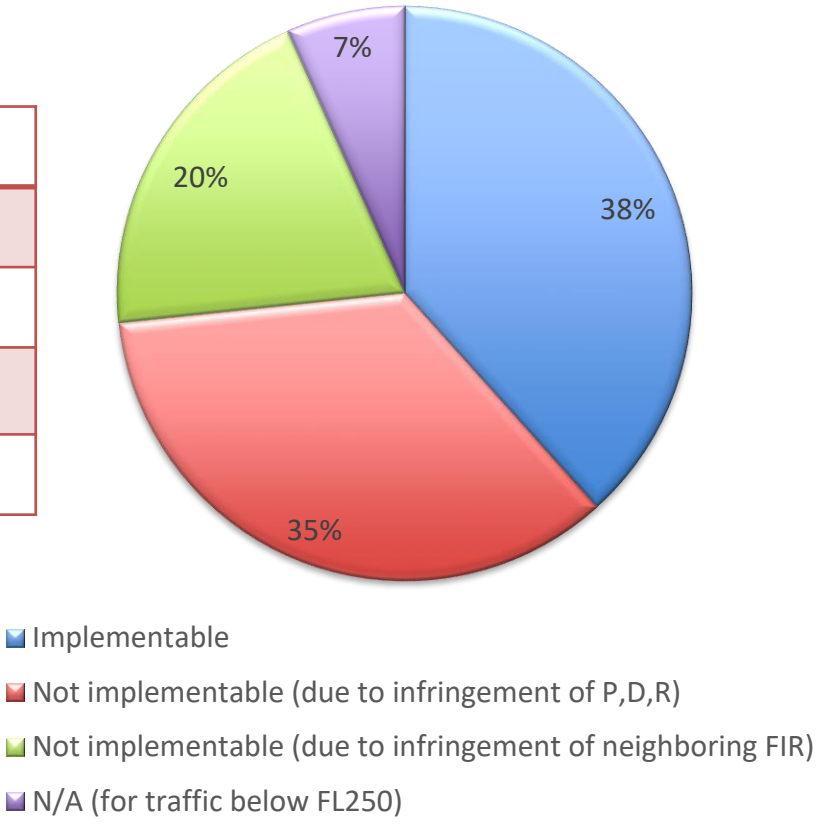
Planning and Design (concept design)

FRA W RTE Concept Phase avoid (OMR,P,D sectors and FIR)



Planning and Design (concept design)

Current number of standard routing	60
Implementable	23
Not implementable (due to infringement of P,D,R)	21
Not implementable (due to infringement of neighboring FIR)	12
N/A (for traffic below FL250)	4



Stage 2: Benchmarking & Coordination (10%)

- **Timeline:** 30th September 2022 – 30th October 2022
- **Tasks:**
  - Conduct a benchmarking exercise with a leading ANSP that has successfully implemented FRA.
  - Coordinate with stakeholder. (Mil & Indigo)
- **Outcome:**
  - Gained insights and best practices from other ANSPs.
  - Refine the UAE's FRA implementation strategy.

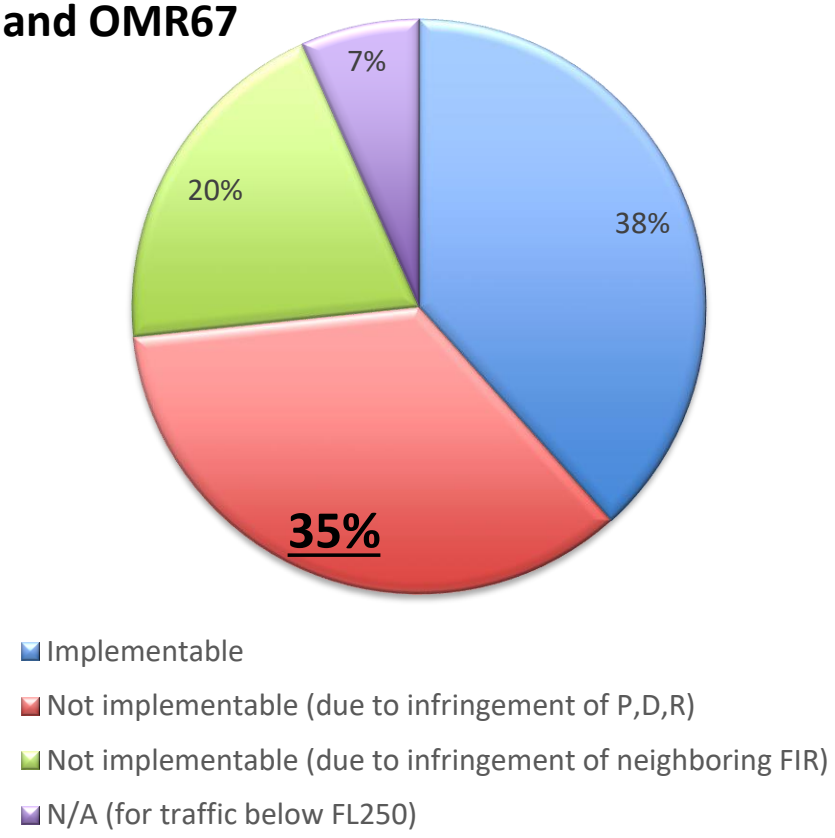
Benchmarking

- **Benchmarking:** NATS (UK)
  The UAE FRA team conducted a benchmarking session with NATS (UK) and prepared questions from various departments and experts within the UAE FRA team.
- **Outcome:**
  The benchmarking session provided valuable insights that contributed to refining FRA implementation strategies, facilitating a smooth transition, and reducing operational risks

Coordination

- **Amend of Upper Limit of OMD22, OMR51 and OMR67**

Agreed with UAE military to lower the upper limit of OMD22, OMR51, and OMR67 to FL300, facilitating the implementation of FRA in the UAE FIR.



Coordination

- **Stakeholder Benefits Sample (IndiGo) 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**

Stage 3: Air Traffic Control Procedures (15%)

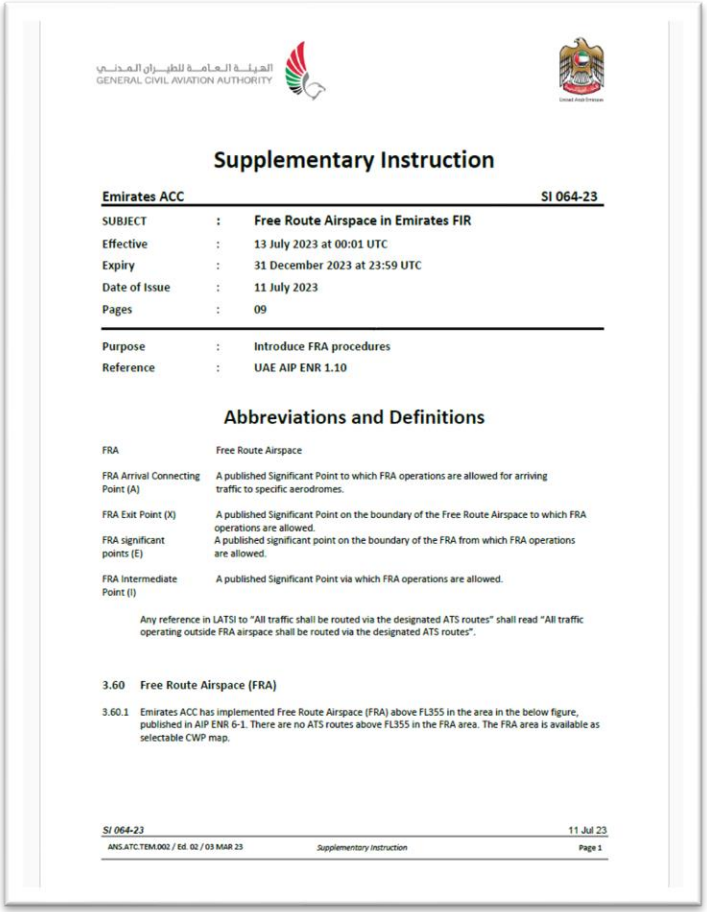
- **Timeline:** 30th October 2022 – 30th November 2022
- **Tasks:**
  - Identify and develop specific procedures for air traffic controllers and assistants to manage FRA operations effectively. Publish these procedures for all operational staff to ensure uniform understanding and application.
- **Outcome:**
  - Established and published ATC procedures that provide clear guidance for managing air traffic within FRA.

Procedure Development

- **Supplementary Instructions Include:**

  Development of procedures to manage FRA operations effectively, including coordination protocols and traffic management strategies.

  - Abbreviations and definitions.
  - FRA chart with all relevant elements.
  - Any other amendments to the existing LATSI (Local Air Traffic Service Instructions).



الهيئة العامة للطيران المدني
GENERAL CIVIL AVIATION AUTHORITY

Supplementary Instruction

Emirates ACC		SI 064-23
SUBJECT	:	Free Route Airspace in Emirates FIR
Effective	:	13 July 2023 at 00:01 UTC
Expiry	:	31 December 2023 at 23:59 UTC
Date of Issue	:	11 July 2023
Pages	:	09
Purpose	:	Introduce FRA procedures
Reference	:	UAE AIP ENR 1.10

Abbreviations and Definitions

FRA	Free Route Airspace
FRA Arrival Connecting Point (A)	A published Significant Point to which FRA operations are allowed for arriving traffic to specific aerodromes.
FRA Exit Point (X)	A published Significant Point on the boundary of the Free Route Airspace to which FRA operations are allowed.
FRA significant points (E)	A published significant point on the boundary of the FRA from which FRA operations are allowed.
FRA Intermediate Point (I)	A published Significant Point via which FRA operations are allowed.

Any reference in LATSI to "All traffic shall be routed via the designated ATS routes" shall read "All traffic operating outside FRA airspace shall be routed via the designated ATS routes".

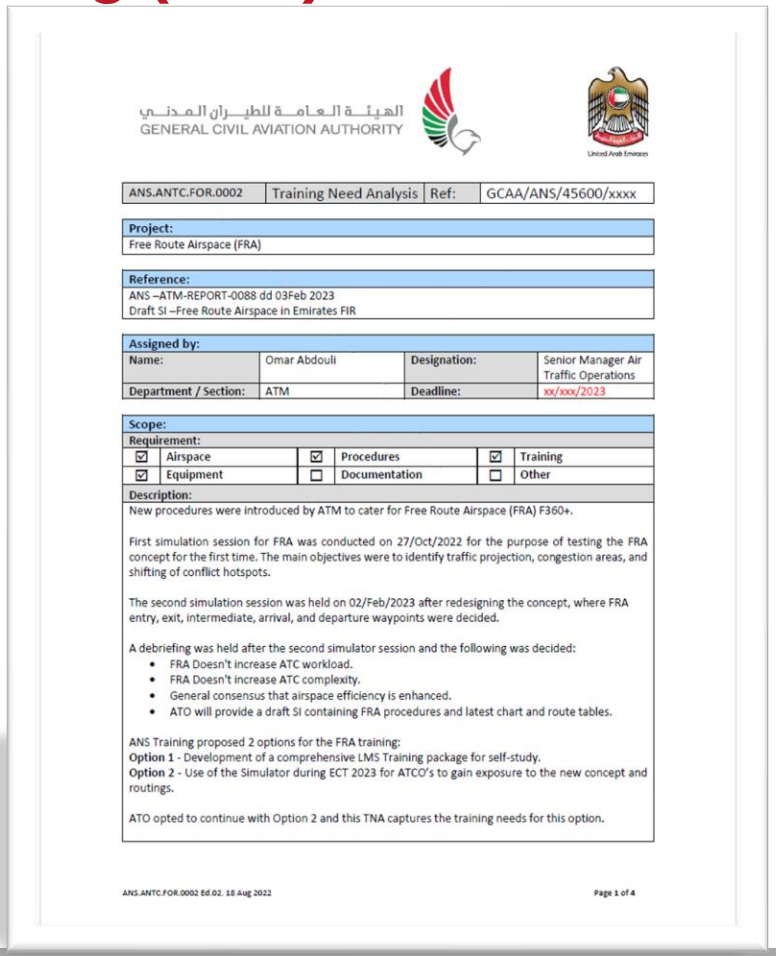
3.60 Free Route Airspace (FRA)

3.60.1 Emirates ACC has implemented Free Route Airspace (FRA) above FL355 in the area in the below figure, published in AIP ENR 6-1. There are no ATS routes above FL355 in the FRA area. The FRA area is available as selectable CWP map.

Stage 4: Training and Simulation (15%)

- **Timeline:** 30th November 2022 – 30th December 2022
- **Tasks:**
  - Prepare comprehensive training packages for operational staff
  - conduct real-time simulations to test the FRA design and ATC procedures.
  - Conduct a TNA *(Regulatory Requirements)*
- **Outcome:**
  - Make necessary amendments based on simulation outcomes.
  - Operational staff are fully trained, and the FRA design is validated through simulations, ensuring readiness for full implementation.

Stage 4: Training (TNA)



الهيئة العامة للطيران المدني
GENERAL CIVIL AVIATION AUTHORITY

United Arab Emirates

ANS.ANTC.FOR.0002	Training Need Analysis	Ref:	GCAA/ANS/45600/xxxx

Project:
Free Route Airspace (FRA)

Reference:
ANS –ATM-REPORT-0088 dd 03Feb 2023 Draft SI –Free Route Airspace in Emirates FIR

Assigned by:			
Name:	Omar Abdouli	**Designation:**	Senior Manager Air Traffic Operations
Department / Section:	ATM	**Deadline:**	xx/xxx/2023

Scope:					
Requirement:					
☑	**Airspace**	☑	**Procedures**	☑	**Training**
☑	**Equipment**	☐	**Documentation**	☐	**Other**

Description:

New procedures were introduced by ATM to cater for Free Route Airspace (FRA) F360+.

First simulation session for FRA was conducted on 27/Oct/2022 for the purpose of testing the FRA concept for the first time. The main objectives were to identify traffic projection, congestion areas, and shifting of conflict hotspots.

The second simulation session was held on 02/Feb/2023 after redesigning the concept, where FRA entry, exit, intermediate, arrival, and departure waypoints were decided.

A debriefing was held after the second simulator session and the following was decided:

- FRA Doesn't increase ATC workload.
- FRA Doesn't increase ATC complexity.
- General consensus that airspace efficiency is enhanced.
- ATO will provide a draft SI containing FRA procedures and latest chart and route tables.

ANS Training proposed 2 options for the FRA training:
Option 1 - Development of a comprehensive LMS Training package for self-study.
Option 2 - Use of the Simulator during ECT 2023 for ATCO's to gain exposure to the new concept and routings.

ATO opted to continue with Option 2 and this TNA captures the training needs for this option.

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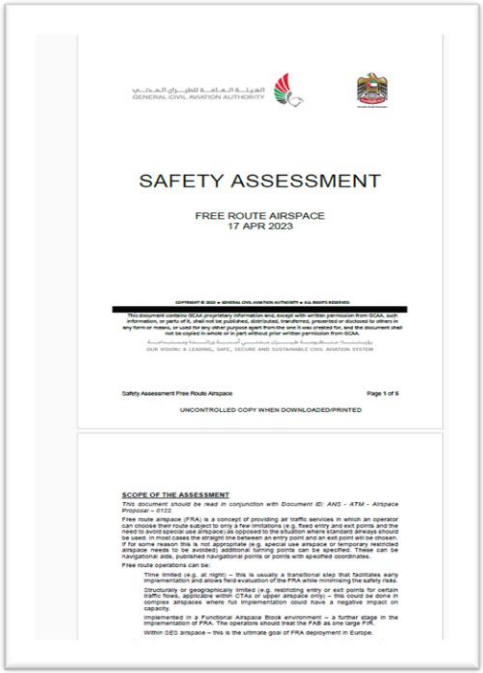
Training and Sim:

- **Simulation Runs:**
  - Three simulation sessions were conducted with ATCOs from *diverse experience* backgrounds:
  - Each simulation included ATCO feedback and was followed by FRA team meetings with a MoM discussion.
- **Comprehensive Training Programs:**
  - Designed for operational staff, incorporating real-time simulations to test and validate FRA procedures.
  - LMS (Learning Management System) training.
  - Identifying potential issues and making necessary adjustments before full-scale implementation.

Stage 5: Operational Impact Assessment (10%)

- **Timeline:** December 2022 – January 2023
- **Tasks:**
  - Identify risks associated with FRA operations and apply mitigation strategies.

- **Outcome:** Comprehensive risk assessment and mitigation plan developed, along with an evaluation of the FRA's operational impact to ensure safe and effective implementation.



SAFETY ASSESSMENT

FREE ROUTE AIRSPACE
17 APR 2023

UNCONTROLLED COPY WHEN DOWNLOADED/PRINTED

SCOPE OF THE ASSESSMENT

Stage 6: Information Publication (15%)

- **Timeline:** 30th January 2023 – 30th April 2023
- **Tasks:**
  - Publish FRA-related information in the Aeronautical Information Publication (AIP).
  - Ensure airspace users have sufficient time to adjust procedures or update equipment as necessary.
- **Outcome:**
  - Timely and accurate publication of FRA information allowing for smooth adoption by airspace users and stakeholders.

Stage 6: Information Publication (15%)

- Published Aeronautical Information Circular (AIC) for (FRA).
- Amended the necessary sections in the UAE Aeronautical Information Publication (AIP), including:
  - **ENR 1.9**: Air Traffic Flow Management and Airspace Management.
  - **ENR 2.2.5**: Free Route Airspace (FRA).
  - **ENR 3.2**: Area Navigation (RNAV) Routes.
  - **ENR 4.4**: Name Code Designators for Significant Points.
  - **ENR 6-1**: Free Route Airspace (Chart ENR 6-1).
  - **ENR 6-3**: En-Route chart - Emirates FIR (Chart ENR 6-3).
  - **FIR Boundary Coordinates**: Updated for consistency with FRA operations.


Aeronautical Information Circular - United Arab Emirates

General Civil Aviation Authority

OMAE - EMIRATES FIR - FREE ROUTE AIRSPACE (FRA) IMPLEMENTATION

INTRODUCTION

DESCRIPTION

Stage 7: Implementation and Readiness (15%)

- **Timeline:** 30th April 2023 – 30th July 2023
- **Tasks:**
  - Finalize the FRA design and ensure the readiness of all operational staff through comprehensive training and coordination with stakeholders.
  - Monitor initial operations closely to identify and address any emerging issues.
- **Outcome:**
  - Full implementation of FRA with all operational staff trained and ready
  - Ensuring seamless integration of FRA within the UAE airspace.

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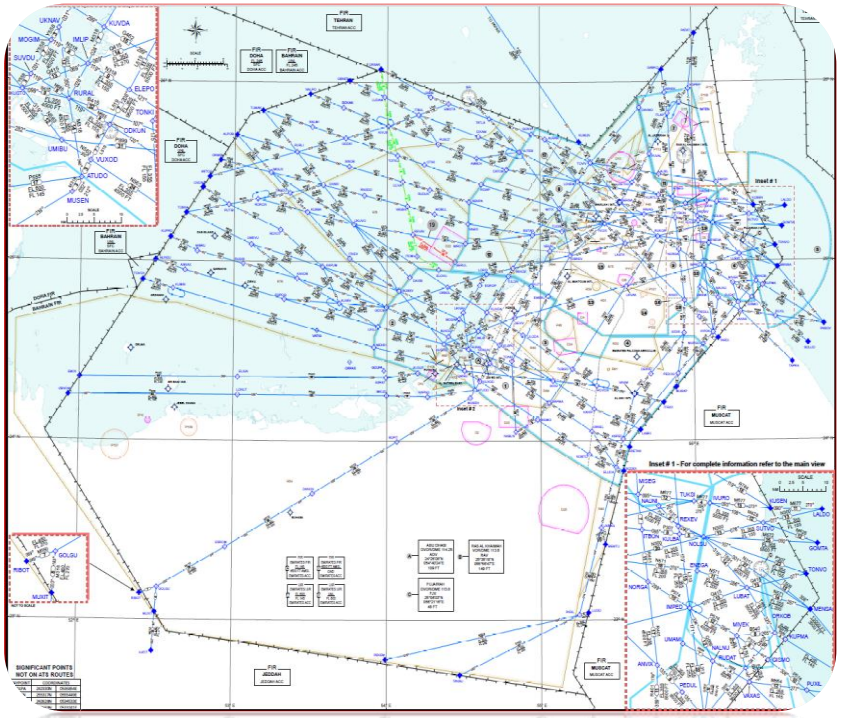
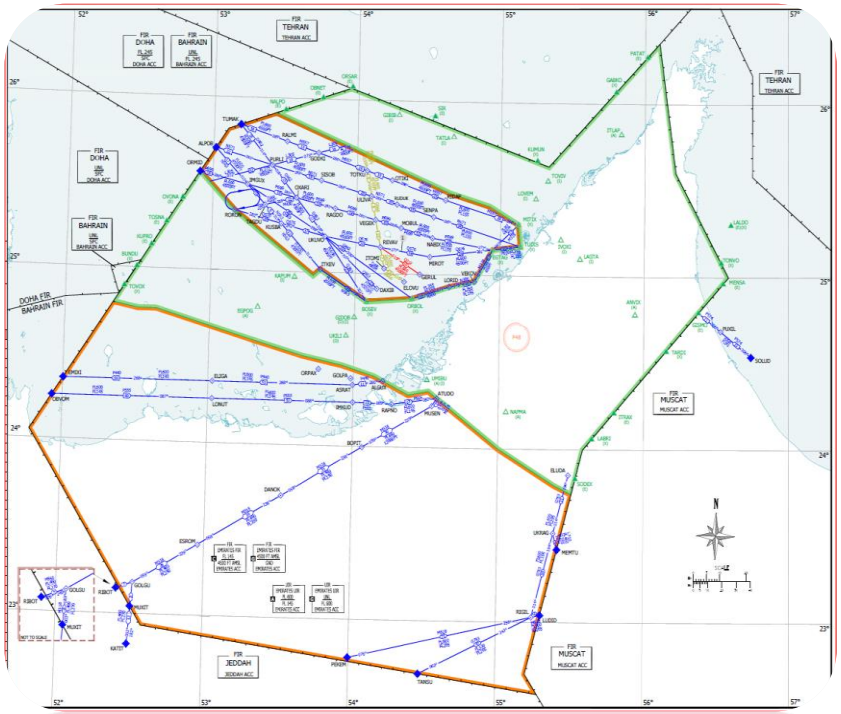
Stage 7: Implementation and Readiness (15%)





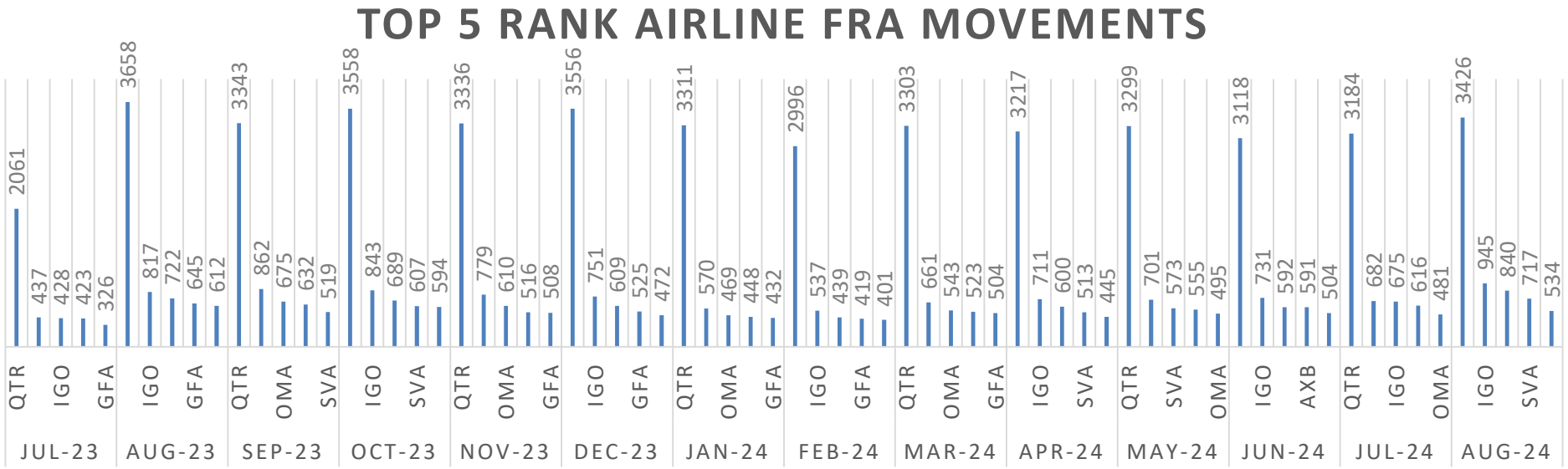
Key Considerations:

- Continued monitoring and assessment of FRA operations to ensure ongoing safety, efficiency, and alignment with international best practices.
- Regular updates and communication with stakeholders to maintain alignment and address any challenges.

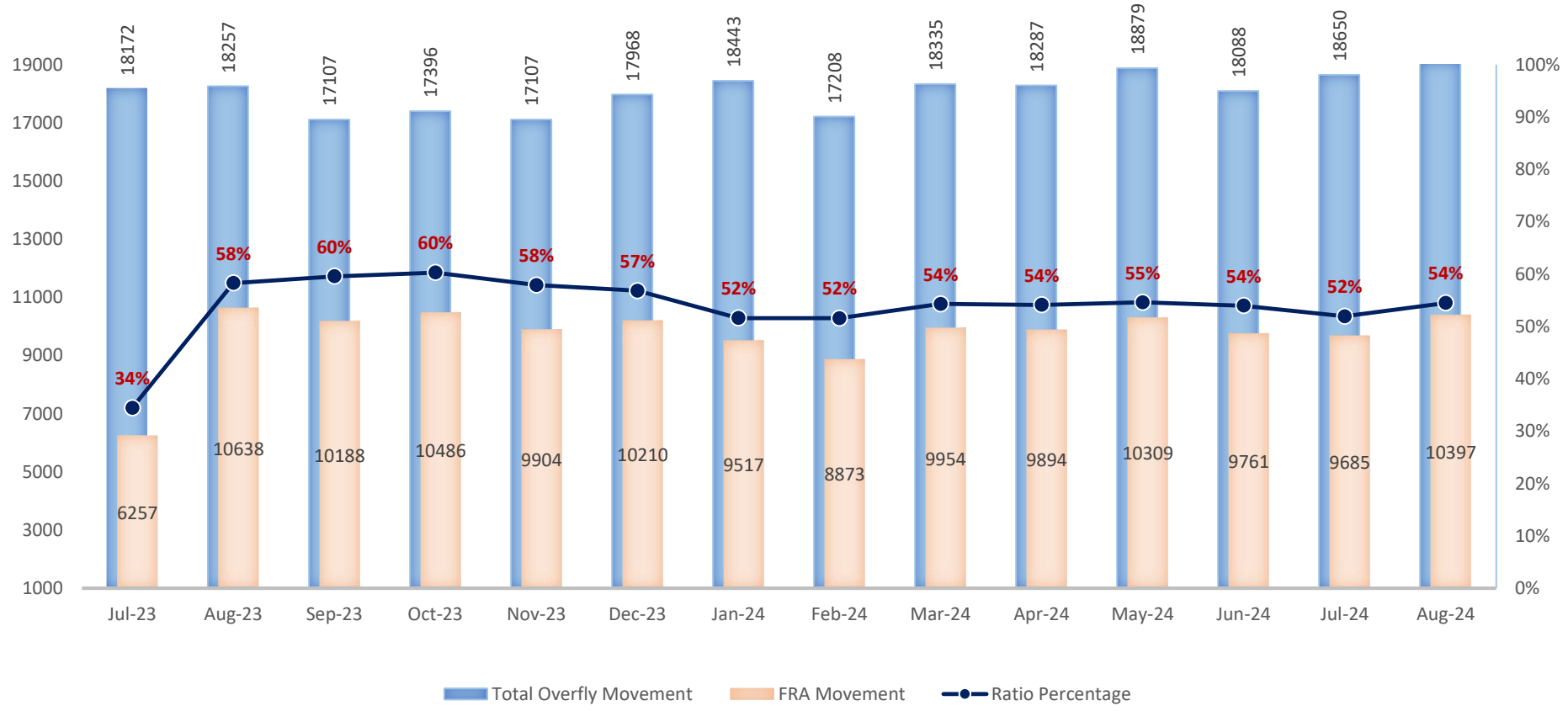
Post-Implementation Analysis and Benefits Case Study

UAE ANSP monitors FRA usage to enhance operations:

- Total traffic overflying UAE airspace
- Airlines using FRA most frequently
- Busiest city-pair routes within UAE FRA

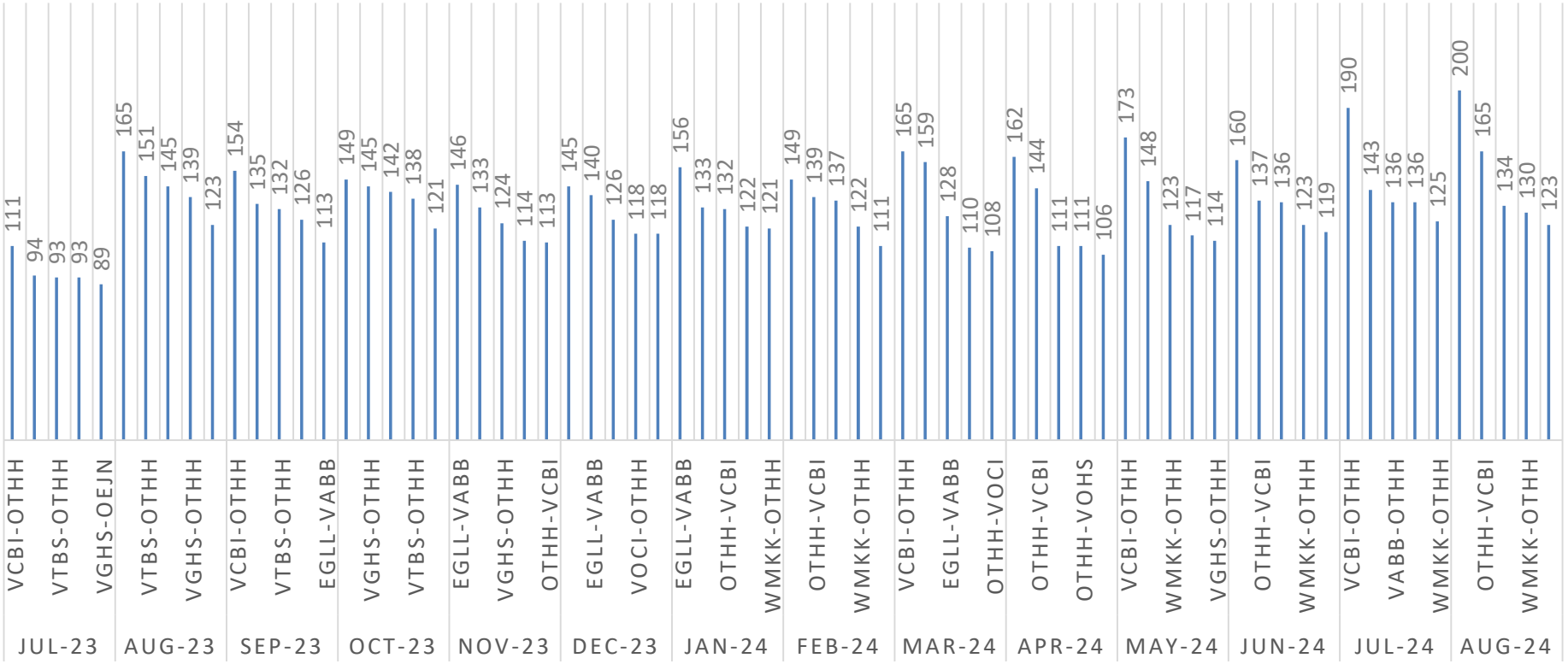


Post-Implementation Analysis and Benefits Case Study



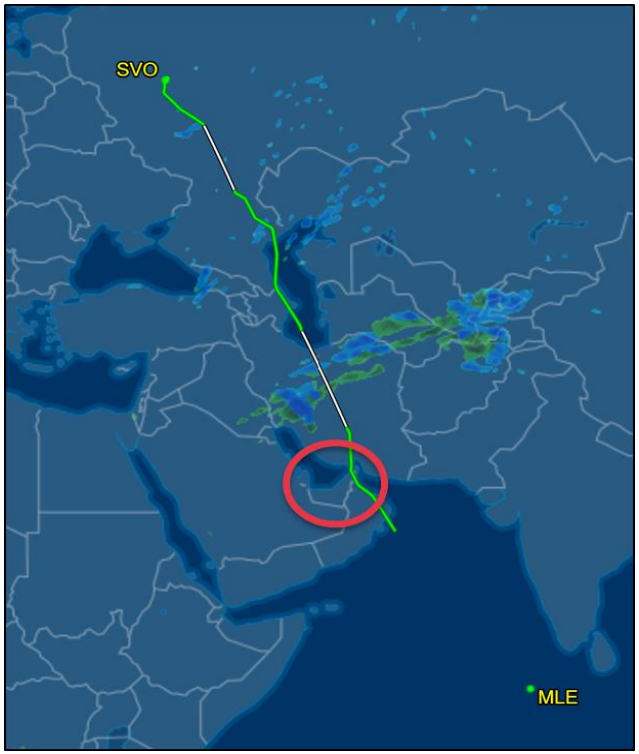
Post-Implementation Analysis and Benefits Case Study

TOP 5 CITY PAIRS FRA MOVEMENTS



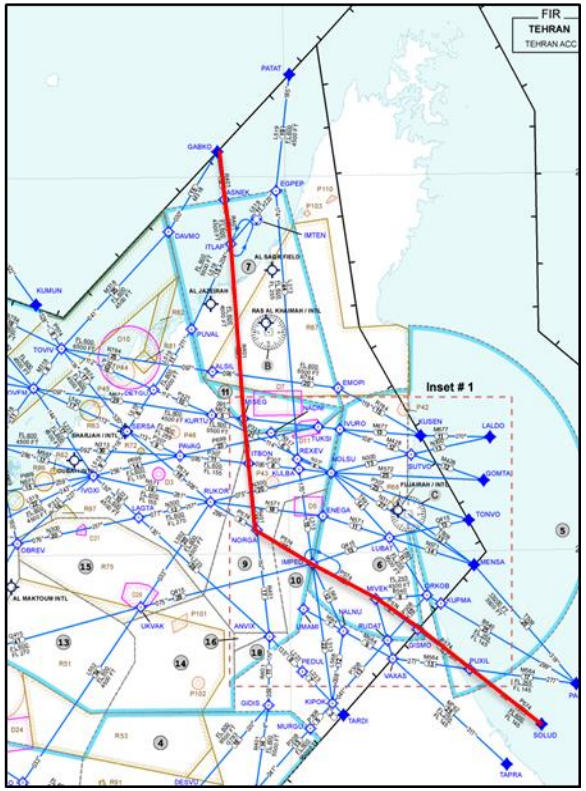
Post-Implementation Analysis and Benefits Case Study

Sample Flight	
Airline	Aeroflot
Departure	Male (VRMM)
Destination	Moscow (UUEE)
Distance	3558 NM
Aircraft Type	B77W
Flight Time	8h:56m
Fuel	89207 KG
Altitude	FL370

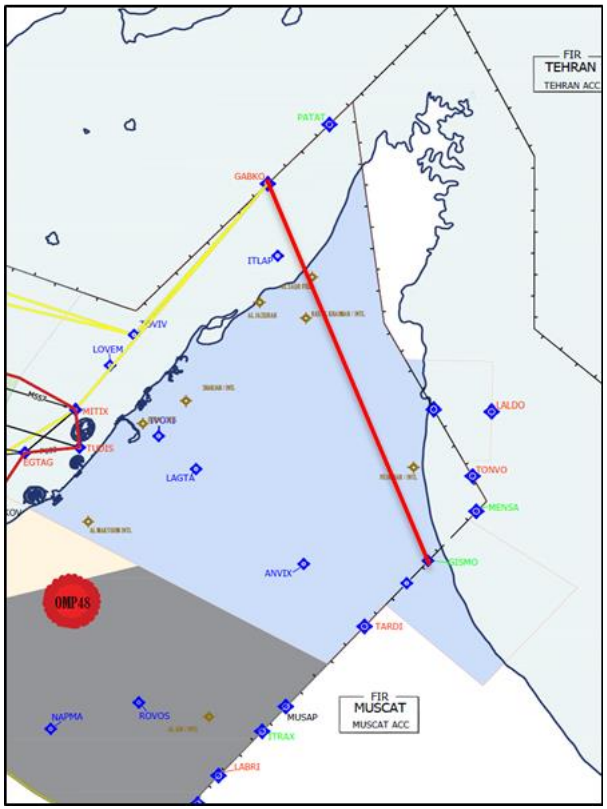


Post-Implementation Analysis and Benefits Case Study

Normal Routing = 90.7 NM



FRA = 82.3 NM

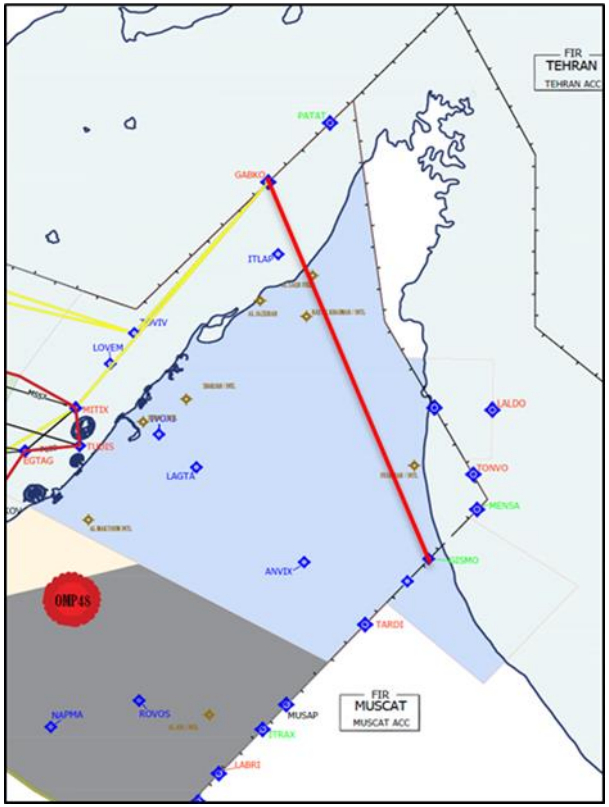


Post-Implementation Analysis and Benefits Case Study

- On normal routing this flight would fly **10:51 minutes** in the Emirates FIR
- With FRA it would fly **9:53 minutes**
- Approximately **1 minute** of flying time is saved

- A saving of **8.4 NM** for this flight would mean:
  - With current fuel price: USD 2.83/gallon
  - B777 burns 42 gallons/minute
  - Therefore, a saving of **8.4 NM** would provide approx. a total of **USD 4338.39** over a one year period for this airline on a frequency of one daily flight.

FRA Saving = 8.4 NM



Disclaimer: In this modelling exercise the desire for accuracy is moderated by the level of complexity the analyst is willing to accommodate, in addition to other specific factors for airlines that ANS is unaware of nor has access to.

Sources used for the calculations:
http://fuelplanner.com/index.php
https://airplanemanager.com/flightcalculator.aspx
https://www.spikevm.com/calculators/time/nautical-mile-knots.php

Future Directions and Regional Cooperation

Phase One

- ANS Management to endorse the proposed method
- Agreement on the establishment flight level
- Agreement on the number of ATS routes for Phase One
- Inclusion of required units (AIM, ANA, …etc)
- Preparation of IFPD concept*
- Initial simulator trial runs to identify hotspots & traffic behavior
- Draft ATC procedures

Future Directions and Regional Cooperation

Phase Two

- Addition of the routes that has been identified as implementable under condition (6)
- Lower the FRA flight level
- Explore with the military to possibility to limit publication of D22 to a level lower than FRA level

Phase Three

- Given FUA is implemented the whole of Emirates FIR becomes FRA with a lower level
- Integration of PDR activation/deactivation through ATFM or Airspace Reservation System
- Dynamic FRA level depending on activity in the FIR & proper publication for stakeholders

Future Directions (Case Study)

Case Study with الاتحاد ETIHAD AIRWAYS

Flight from HECA → OMAA

Legacy Route Structure	
Total Distance	1,360 NM ↑

FRA Opportunity	
Total Distance	1,286 NM ↓
Saved NM	74 NM
CO_2 Savings	1,374 KG/flight

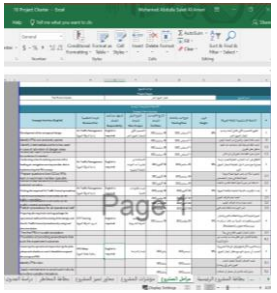
FRA Benefit	
Flight Frequency	730 flights/year
Annual CO_2 Savings	1,003,020 KG

Conclusion and Key Takeaways

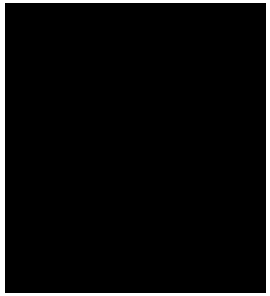
- **Key Achievements:**
  - **Enhanced Airspace Utilization:** Optimized routing options have reduced congestion and improved traffic flow management, contributing to a safer and more efficient airspace environment.
  - **Fuel and Cost Savings:** Airlines operating within the Emirates FIR have benefited from reduced flight distances and lower fuel consumption, leading to cost savings and reduced environmental impact.
  - **Positive Feedback from Stakeholders:** The successful implementation of FRA has received strong support from airlines, air traffic controllers, and regional partners, who have noted the benefits of the new system in terms of flexibility and efficiency.
- **Future Outlook:**
  - Building on the success of FRA Phase One, the UAE is committed to expanding the FRA concept to include more airspace sectors and lower flight levels, further enhancing air traffic efficiency and regional cooperation.
  - Continued collaboration with neighboring FIRs and stakeholders will be essential to maximize the benefits of FRA and develop a more integrated regional airspace management strategy.

Overview of the Project

- The Project Charter



- FRA Video



- AN-Conf/14-WP/38 27/6/2024