



AFI FRA PMT5 and UPR WS , OCTOBER 2024, NAIROBI

21 to 25 October 2024, NAIROBI, KENYA

AFI FRA PMT5 PROGRES REPORT

Presented by AFI FRA PMT



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FRA CONCEPT DEFINITION

- A **specified airspace** within which users may freely **plan a route between a defined entry point and a define exit point**, with the possibility to route via intermediate (published or unpublished) way points, **without reference to the ATS route network**, subject to airspace availability.
- Free Route operations enable airspace users to fly as closely as possible to their preferred trajectory **without being constrained by fixed route networks or structures**. In an FRA airspace, all fixed route networks can be removed.
- Flights remain subject to air traffic control.
- Active airspace reservations are crossed or avoided depending on the degree of coordination (including civil/military coordination) and the status of the activity in the area.
- It is important to note the difference between “Direct Routing Operations” (DRO) and “Free Route airspace” (FRA) operations.
- Direct Route Operations will precede the implementation of Free Route Airspace.



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FRA benefits to airspace users

States or Regions that have developed and successfully implemented FRA concept of operations have demonstrated that there are clear benefits to airspace users as well as improvement of airspace utilization. The overall benefits are : reduced flight time, fuel consumption and CO2 emissions.



Testimony from Lisboa FIR :

"On the 7th of May 2010, the Free Route Airspace concept in Lisbon FIR, FRAL project, celebrated its first anniversary with the satisfactory recognition from the airspace user's community in favor of the success of the project. After this first year it can be concluded:

- FRA was founded in a simply and basic number of general procedures;
- No new technical equipment was required, just basic RNAV capability;
- Simplicity has facilitated the success in the execution of the flight planning;...
- Efficiency and flexibility were most appreciated by airline operators;...
- Huge benefits can be obtained for AO's (>1 million NM, >8.000 Tons fuel, >27.000 Tons CO2)."



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AFI FRA PMT KEY ACHIEVEMENTS OUTLINES

The AFI FRA implementation project, launched in 2020, has made significant progress and accomplished several key deliverables and activities, including:

- Second Edition of the FRA Concept of Operations (CONOPS):** This updated edition outlines the procedures for FRA implementation and includes essential safety requirements.
- Gap Analysis:** This analysis assessed the readiness of AFI States to implement FRA, identifying areas for improvement.
- Roadmap to December 2023:** A comprehensive roadmap has been established to guide the implementation process.
- FRA Safety Assessment Template:** An Excel spreadsheet template for safety assessments has been created, complete with illustrative examples.
- AIC/AIP SUP Templates :** Templates have been developed for Aeronautical Information Circulars (AIC) and AIP Supplements (SUP).
- Presentations at Coordination and Regional Meetings:** Engaging presentations have been made during coordination meetings and other relevant opportunities to share progress and gather feedback.

This proactive approach ensures the successful implementation of FRA in the AFI region.

- **West and Central Cluster:** States include ASECNA, Ghana and Nigeria, Cape Verde, DR Congo, Guinea Conakry, Liberia, and Sierra Leone

- **East Cluster:** States include Ethiopia, Kenya, Madagascar, Mauritius, Rwanda, Seychelles, Tanzania, Uganda and, Mogadishu (*)

- **South Cluster:** Angola, Botswana, Malawi, Mozambique, Namibia, South Africa, Zambia and Zimbabwe.

- *(* In the spirit of ICAO No State Left Behind, as much support as possible shall be provided as well to **Somalia** and **South Sudan***



UPR Trials accepted by



AFI FRA PMT4



West and Central Cluster

East Cluster

South Cluster

Where DRO and FRA has been implemented, UPR trials were easier to conduct



FRA Project Management Team (FRA PMT)

- The AFI FRA PMT should be composed of experts from the following states and organizations:
 - ESAF:** Ethiopia, Kenya, Madagascar, Mauritius, Rwanda, Seychelles, Tanzania and Uganda.
 - WACAF:** Cape Verde, Democratic Republic of Congo, Ghana, Nigeria, Roberts FIR, and ASECNA
 - Organizations:** AFRAA, ASECNA, CANSO, EAC, IATA, IFALPA and IFATCA

ASECNA STATE MEMBERS		ASECNA FIRs
Benin	Madagascar	an airspace of 16,100,000 km2 organized into six flight information regions: Antananarivo; Brazzaville ; Dakar Oceanique ; Dakar Terrestrial; Niamey ; Ndjamena.
Burkina Faso	Mali	
Cameroon	Mauritania	
Central African Republic	Niger	
Comoros	Republic of Congo	
Ivory Coast	Rwanda	
Gabon	Senegal	
Guinea-Bissau	Chad	
Equatorial Guinea	Togo	
France (the Saint-Denis-Gillot TMA is located in the Antananarivo flight information region)		



FRA WITHIN REGIONAL DEVELOPMENT AGENCY

FRA IMPLEMENTATION IN REGIONAL

INTENSE ACTIVITIES FOR SEAMLESS SKY INITIATIVE OF EAST AFRICAN COMMUNITY (EAC):

WHERE IMPLEMENTATION OF FRA IS ONE OF THE KEY OBJECTIVE

PMT CONTRIBUTED AT WS IN ARUSHA FROM 1 TO 4 OCTOBER 2024

CIVIL MILITARY COOPERATION TRAINING COURSE CONDUCTED BY EAC FROM 27 TO 29 OCTOBER SPONSORED BY COMESA WITH A FOCUS ON FRA IMPLEMENTATION

PMT READY TO USE EVERY OPEN WINDOW

The East African Community (EAC) is an international organization made up of eight East African countries:

- ❖ Burundi,
- ❖ Kenya,
- ❖ Uganda,
- ❖ The Democratic Republic of Congo,
- ❖ Rwanda,
- ❖ Somalia,
- ❖ South Sudan,
- ❖ and Tanzania.





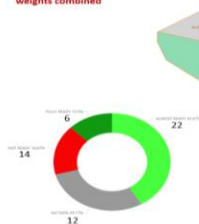
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AFI FRA CLUSTER KEY ACHIEVEMENTS OUTLINES

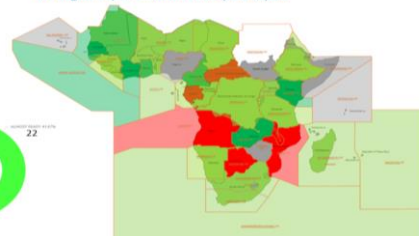
Areas of Focus

- Surveillance
- Communication
- Coordination
- Navigation
- Safety nets
- Airspace procedures
- ADS-C/B, SSR, PSR, MLAT
- VHF, CPDLC, HF
- AMHS, AFTN, OLDI/AIDC
- GNSS, VOR/DME
- APW, M/STCA, CD/R, MONA
- FRA, FUA, ATFM

FRA FIRs Readiness by weights combined



AFI Region Implementation of Airspace Layout



DUAL OBJECTIVE:

ASSESS STATES READINESS TO FRA : NORMAL OPERATIONS

DEGRADED MODE PROCEDURES : EQUIPMENT FAILURE



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AFI FRA CLUSTER KEY ACHIEVEMENTS OUTLINES

IMPACT	A CATASTROPHIC		1, 4	2, 3			
	B SIGNIFICANT				5		
	C MODERATE		7, 8	6			
	D LOW						
	E NEGLECTIBLE						
INTOLERABLE		STOP & MITIGATE	1 IMPROBABLE	2 REMOTE	3 OCCASIONAL	4 PROBABLE	5 FREQUENT
TOLERABLE		MITIGATE					
ACCEPTABLE		MONITOR					
			LIKELIHOOD				

INTOLERABLE
TOLERABLE
ACCEPTABLE

STOP & MITIGATE
MITIGATE
MONITOR

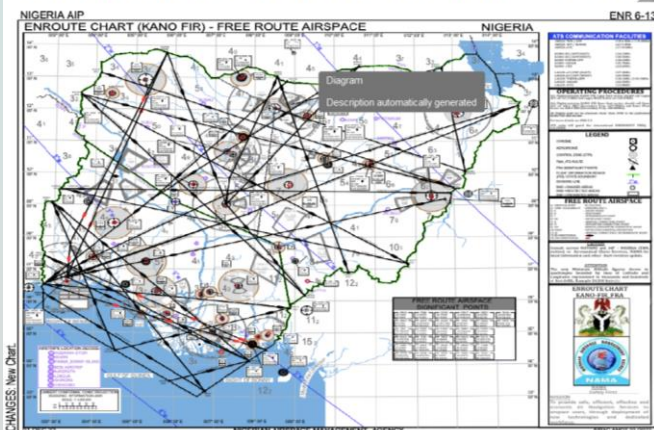
RISK	RISK DESCRIPTION
1	Surveillance equipment capabilities SSR/ADS in FRA implementation
2	Air situation Display Systems
3	Processed Surveillance data
4	Use of ATS-DS in FRA
5	Use of VHF/HF/VDL/CPDLC/SATCOM in AIR/GND comm for FRA
6	Use of interoperable systems within AFI
7	Aircraft equipage and State approval/Oversight to enable FRA
8	Regulatory mandate on equipage



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AFI FRA CLUSTER KEY ACHIEVEMENTS OUTLINES

37 PUBLISHED FREE ROUTE AIRSPACE - LOCAL



The procedures concerning the use of Reptitive Flight Plans (RPL) conform to ICAO Doc 7030 and the PANS-ATM.

1.10.3 Changes to the submitted flight plan

All changes to a flight plan submitted for an IFR flight or a controlled VFR flight and significant changes to a flight plan submitted for an uncontrolled VFR flight shall be reported as soon as possible to the appropriate ATS unit. In the event of a delay in departure of 30

Filing as FRA Intermediate Point (I) of unpublished point, defined by geographical coordinates (LAT/LONG) is allowed provided that LAT/LONG point is defined on the direct line between two published points. Filing bearing and distance within Kano FRA is not allowed.

All eligible flights shall flight plan via FRA significant points according to the table below:

From	To	Remark
FRA Horizontal Entry Point (E)	FRA Horizontal Exit Point (X)	
	FRA Intermediate Point (I)	
	FRA Arrival Connecting Point (A)	
	FRA Horizontal Exit Point (X)	
FRA Intermediate Point (I)	FRA Intermediate Point (I)	Fight plan direct or via one or several intermediate points.
	FRA Arrival Connecting Point (A)	
	FRA Horizontal Exit Point (X)	
FRA Departure Connecting Point (D)	FRA Horizontal Exit Point (X)	
	FRA Intermediate Point (I)	

Route portions between significant points or geographical coordinates shall be indicated by means of "DCT" in accordance with ICAO Doc 4444 Appendix 2 'Flight Plan, Item 15'.

Within Kano FIR FRA, there is no limitation on the:

- Number of FRA intermediate points used.
- Maximum DCT distance.

In these cases, operators may file a "free route" from/to a published FRA Horizontal Entry/Exit point to/from a published FRA Arrival/Departure Connecting point or from a published FRA Horizontal Entry point to a published FRA Horizontal Exit point.

1.10.4.3 Cross Border Application - NOT ALLOWED

1.10.4.4 Use of Geographical Coordinates in FPL ITEM 15: ROUTE



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AFI FRA CLUSTER KEY ACHIEVEMENTS AND CHALLENGES

PREPARATION FOR SAFETY RISK ASSESSMENT AND MANAGEMENT

Done by individual states

ASESCNA however had a joint session in Duala

Ghana Conducted the Safety Assessment in April of 2023

Resolution

- Coordination Enhancement
- Safety assessment review
- UPR feedback
 - Airspace Requirements
 - Experience
- FRA LOA Amendments

Workshop

- Implementation By-in
- Roadmap – Jan 2025
- Safety assessment
- Harmonised Implementation planning
- Synchronised Publication
- Harmonised Implementation



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AFI FRA EASTERN CLUSTER STATUS AND CHALLENGES

Element	FMP	FSIA	HCMM	HINA	HTDA	HUEN	FMM	All states	Oceanic
Airspace structure within the FIR									
Published Direct Routing Operations (DRO) - Specify between which FIRs/Routes	YES	YES	YES	YES	YES	YES	YES	100%	100%
Unpublished direct segments - Specify between which FIRs/Routes	NO	YES	NO	YES	NO	NO	YES	43%	50%
Free Routing Airspace (FRA) - Specify vertical limits	YES	YES	NO	NO	NO	YES	NO	43%	33%
Harmonization of standards									
Separation standards are harmonized with adjacent FIRs	YES	YES	YES	YES	YES	YES	YES	100%	100%
Existing navigation specification/application are aligned with the regional Air Navigation Plan	YES	YES	YES	YES	YES	YES	YES	100%	100%
ATM systems enabling FRA									
Surveillance	YES	YES	YES	YES	YES	YES	YES	100%	100%
ADC/OLDI	YES	NO	YES	YES	YES	YES	YES	100%	83%
Coordination procedures									
Exchange of flight data can allow/allows possibility of transfer at random points	YES	YES	YES	NO	YES	YES	NO	71%	67%
LoAs signed with all adjacent FIRs	YES	YES	YES	YES	YES	YES	YES	100%	100%
LoAs accommodate published DROs	NO	YES	YES	YES	NO	NO	NO	43%	50%
LoAs accommodate unpublished DROs	NO	NO	NO	YES	NO	NO	YES	29%	33%
Joint coordination meeting when necessary, sign LOA and publish relevant Aeronautical Information	YES	YES	YES	NO	YES	YES	YES	86%	83%
ATM Personnel Capacity									
Awareness has been conducted for operational issues	YES	YES	YES	YES	YES	YES	YES	100%	100%
Lessons learned shared regularly	YES	YES	YES	YES	YES	YES	YES	100%	100%
Safety Assessment									
There is in place an safety assessment mechanism for airspace change	YES	YES	YES	YES	YES	YES	YES	100%	100%
There is an approval process for the safety assessments	YES	YES	YES	YES	YES	YES	YES	100%	100%
Post implementation									
There is in place a process for Post-implementation monitoring that adjusts targets	YES	YES	YES	YES	YES	YES	YES	100%	100%
Flexible Use of Airspace (FUA)									
There is in place effective civil-military cooperation that promotes FUA	NO	NO	YES	YES	YES	YES	NO	57%	50%

- GAP Analysis
- DRO / DCT
 - Tactical
 - published
- Focus areas
 - Coordination
 - CMAC/FUA
- Strategic Actions
 - Coordination
 - LOA
 - Enhanced CMAC/FUA

Resolutions

- CMAC /FUA Enhancement
- Cluster implementation planning
- Regional safety assessment

Challenges

- Participation
- Awareness Training – Workshops
- Publication



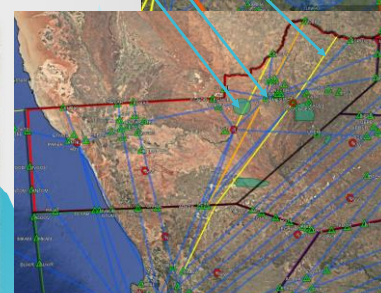
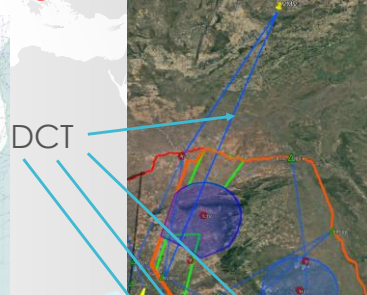
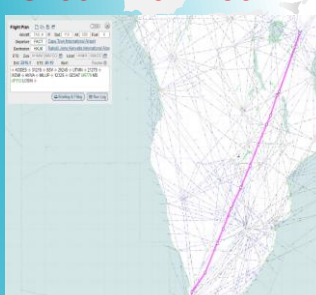
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AFI FRA SOUTHERN CLUSTER STATUS AND CHALLENGES

- GAP Analysis
- DRO / DCT
- Focus areas
 - Coordination
 - CMAC/FUA
- Challenges
 - ATM and Infrastructure Modernisation
 - CMAC/FUA implementation/Enhancement
 - Regional project alignment
 - Regional Implementation Roadmap

UPR Trial Experience / Feedback

- Coordination
- Military Areas
- Hotspots management
- FRA/DCT Procedures





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	Mauritius	GHANA	NIGERIA	Uganda	ASECNA
FRA operations	FRA with UPR	FRA with AORA	FRA	FRA	FRA
Time of Operation			H24	H24	H24
Area of Application	FL245 - FL460 South Part 25S	FL290 - FL460 Lat 2N - 11N	Above FL245	Above FL250	Above FL250
Fixed routes co-existence	Yes	Yes	Yes	Yes	Yes
Eligible Flights	Overflights	Overflight	Arr, Dep, Overflight	Overflights	
Entry/Exit points	Published Way points ; Entry/Exit	Existing routes Entry/Exit	Existing routes Entry/Exit	Existing routes Entry/Exit	
Lat/Long Coord usage	Allowed	Between Two Published WP			
Equipment	ADS-C, CPDLC	ADS-B ADS-C RNAV 5 / 10		TCas II, Mode S, ADS B or ADS C CPDLC	TCas II, Mode S, ADS B or ADS C CPDLC
DCT Segment length max	Not applicable	Not Applicable		200Nm	200Nm
UPR Interval reporting	60 min				
RNAV Spec	10	5 or 10			
Cross border application		Not allowed	Not allowed	Prior Coord.	Prior Coord.
FPL before EOBT				3H - 2H	
FPL Closer to FRA border	3Nm or more	5 Nm or more	3Nm or more	Published	
Available E/X points					
Available DCTs		Published	Published		
Combination E/X/I			Specified	Not Spec.	Not Spec.
Flexible use of airspace		Prior CMC	NOTAM or Tactic	Prior CMC	Not Allowed



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	DR CONGO	Seycheles	Ethiopia	Kenya	Dar es Salam	Zimbabwe
FRA operations	DRO	UPR	DRO	DRO	DRO	DRO
Time of Operation	H24	H24		H24	H24	H24
Area of Application	Above FL290	Above FL245	Above FL290	Above FL250	Above FL250	Above FL245
Fixed routes co-existence	Yes	Yes	Yes	Yes	Yes	Yes
Eligible Flights	Overflight	Overflights	Overflights	Overflights	Overflights	Overflights
Entry/Exit points	Published Way points	Published Way points	Existing routes Entry/Exit	Published DCT only	Existing routes Entry/Exit	
Lat/Long Coord usage	Allowed	Allowed				
Equipment	TCas II, ADS B or ADS C CPDLC	ADS-C, CPDLC	Mode-S, ADS-B		TCas II, Mode S, ADS B or ADS C CPDLC	TCas II, Mode S, ADS B or ADS C CPDLC
DCT Segment length max	200Nm		200Nm		200Nm	200Nm
UPR Interval reporting		30 min				
RNAV Spec		10				
Cross border application			Prior Coord.		Prior Coord.	Prior Coord.
FPL before EOBT	1H				3H	6H
FPL Closer to FRA border						
Available E/X points						
Available DCTs				Published	Published	
Combination E/X/I				Specified	Specified	Not Spec.
Flexible use of airspace	Prior CMC	Prior CMC			Prior CMC	Prior CMC
FRA/DRO Suspension (Faillure of...)			Wx, CNS, Contingency	Surveillance		

INTRODUCTION OF UPR TRIALS AND THEIR IMPACT ON AIRSPACE OPTIMIZATION

1.Introduction

- Overview of UPR (User Preferred Routes) trials.
- Importance of coordination by the FRA (Free Route Airspace) team.



DATE	Flight N.	Real Time Saving [Min.]	Real Fuel Saving [KGS]	CO2 Reduction [KGS]	Cost Saving [\$]
24/04/2024	ETH512	0:06	KGS 563.00	KGS 1,779.08	\$ 850.00
	ETH934	0:00	KGS 178.00	KGS 562.48	\$ 203.00
25/04/2024	ETH935	0:06	KGS 619.00	KGS 1,956.04	\$ 825.00
	ETH513	0:06	KGS 68.00	KGS 214.88	\$ (955.00)
26/04/2024	ETH935	0:04	KGS 237.00	KGS 748.92	\$ 675.00
	ETH934	0:01	KGS 172.00	KGS 543.52	\$ 208.00
27/04/2024	ETH512	0:06	KGS 563.00	KGS 1,779.08	\$ 850.00
28/04/2024	ETH513	0:06	KGS 68.00	KGS 214.88	\$ (955.00)
29/04/2024	ETH512	0:06	KGS 619.00	KGS 1,956.04	\$ 825.00
30/04/2024	ETH935	0:04	KGS 237.00	KGS 748.92	\$ 675.00
	ETH513	0:06	KGS 68.00	KGS 214.88	\$ (955.00)

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INTRODUCTION OF UPR TRIALS AND THEIR IMPACT ON AIRSPACE OPTIMIZATION

2.Benefits of UPR Trials

- Facilitation of direct cross-border routes.
- Potential for optimizing the route network in upper airspace at FIR (Flight Information Region) boundaries.

3.Long-term Goals

- Streamlining air traffic flow across borders by **defining efficiently entry, exit and intermediate points.**
- Enhancing overall efficiency and safety in airspace management.

4.Integration with Lower Airspace

- Need to reassess connections between FRA and terminal areas.
- Considerations for departure and destination aerodromes.

5.Conclusion

- Summary of the importance of UPR trials in the broader context of airspace management.
- Emphasis on collaboration and adaptation for successful implementation.

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FRA SIGNIFICANT POINTS

LONG TERM FOCUS OF UPR TRIALS : DEFINE EFFICIENTLY EXIAD POINTS

"E"	Entry point	For entering the free route airspace
"X"	Exit point	For exiting the free route airspace
"I"	Intermediate point	For flight level/direction changes
"D"	Aerodrome Departure Point	at the end of SID or at departure aerodrome
"A"	Aerodrome Arrival Point	at the start of STAR or at arrival aerodrome

in a given FRA space, the flight path will be :

Overflight:	E => I* => X
From external FRA to a an aerodrome under FRA:	E => I* => A
From an aerodrome under FRA to the outside:	D => I* => X
Flight linking two aerodromes under FRA :	D => I* => A

Possible Role combination

EX, AD, (EXAD to be discussed) ,...

FRA points founded on 5LNC and NAVAIDs coding

FRA is based on very simple procedures derived from the use of DCT

*as needed, one or more Ex FRA point : OPERO(EX), PISPA(I)

CHALLENGES

- Core team readjustment and its impact on project continuity.
- Acceptance and Management of Change
- Training and Awareness
- Integration of FRA with Fixed Route Operations
- Cross-Border lat/long coordinate usage



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SHARING EXPERIENCE

As the implementation of Free Route Airspace (FRA) and Direct Route Operations (DRO) progresses, establishing robust feedback mechanisms for stakeholders involved in FRA operations is essential.

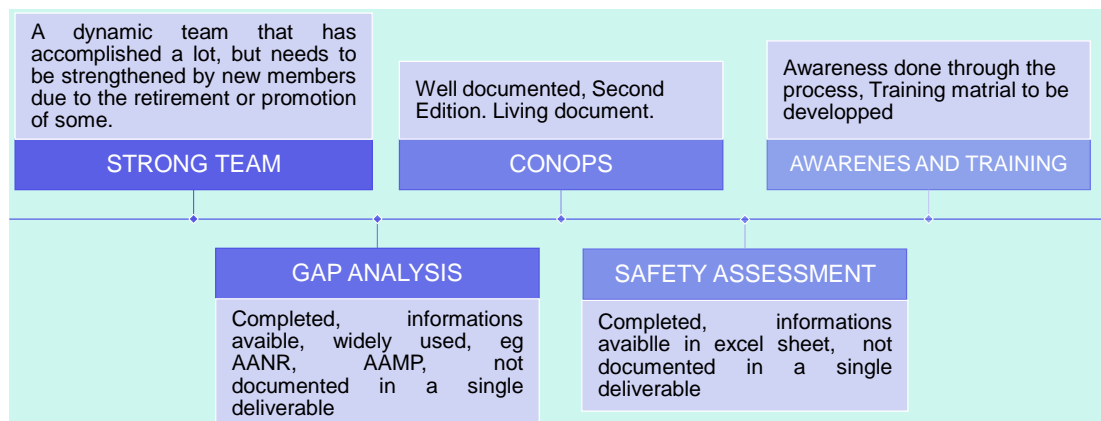
FRA lessons learnt dissemination process



SUMMARY



STEPS OF GREAT IMPACT

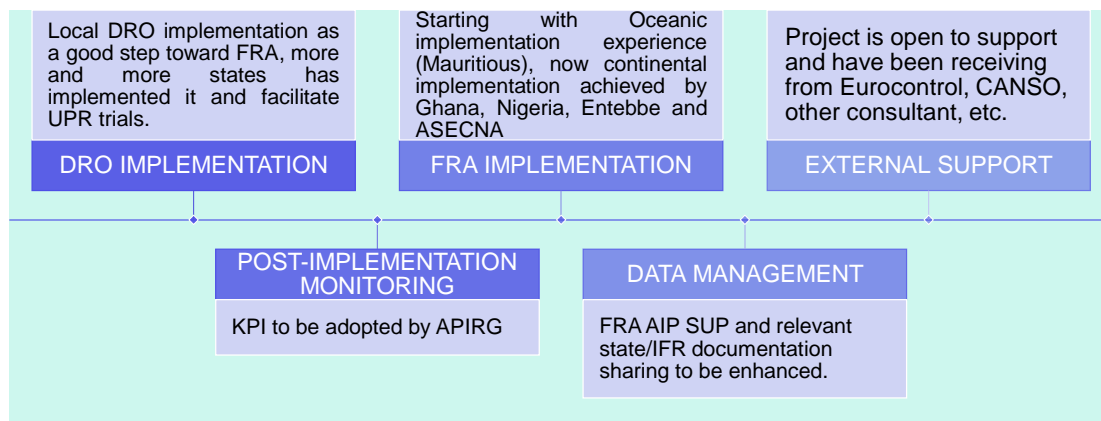


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STEPS OF GREAT IMPACT



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AFI FRA FAQ

Questions	Answers
Intermediate points every 200NM?	Doc4444, recommended practice for DCT, local procedures to specify
FRA and Nav Specification?	No nav specification defined, even basic RVAV can do
FRA a/c approval required?	No, current navigation capability fits.
FRA horizontal boundary same as FIR boundary?	Not necessarily, same FIR can comprise 1 or more FRAs
Conflict detection becomes harder ?	ATC automation provided with conflict detection tools, further training if needed
Congestion at EX points?	Good coordination required
Point beyond FIR for automated ATS	Insert a published FRA significant point beyond in FPL



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Questions?

Comments?

Thank you.

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