IMPLEMENTATION OF FREE ROUTE AIRSPACE – LOCAL IN KANO FIR

FRA SAFETY RISK ASSESSMENT REPORT

BACKGROUND

Consequent upon APIRG 22 Conclusion 22/36(a); “That, to foster the concept of free routing in the AFI continental airspace in preparation for the ASBU B1 module, States consider incorporating Free Route Airspace concept into their national airspace concept and ATM Master Plan in line with the B1-FRTO ASBU module and AAO Sub-Group project plans, Nigeria considered and put machineries in motion for a seamless implementation of FRA concept in its airspace.

The consideration and subsequent decision to implement was strengthened by the successful participation of Nigeria at the Route Lab Workshop held in Accra, Ghana from 15th to 19th December 2019 which resulted in the implementation of more than eleven Flight Plannable Direct Routes in the Nigerian airspace.

Coupled with the recent investment in Communication, Navigation, and Surveillance as well as Air Traffic Management infrastructure embarked upon by Nigeria towards a seamless and harmonized implementation of Block 0 Modules of the ASBU, the stage seems set for a safe and efficient implementation of the FRA in the Nigerian airspace.

SCOPE

The scope of this safety risk assessment is limited to that associated with the implementation of the Free Routing Airspace (Local) in the Nigerian Airspace in accordance with the Concept of Operations (CONOP) submitted for the conceptualization, development, publication, charting and implementation of Free Route Airspace - Local.

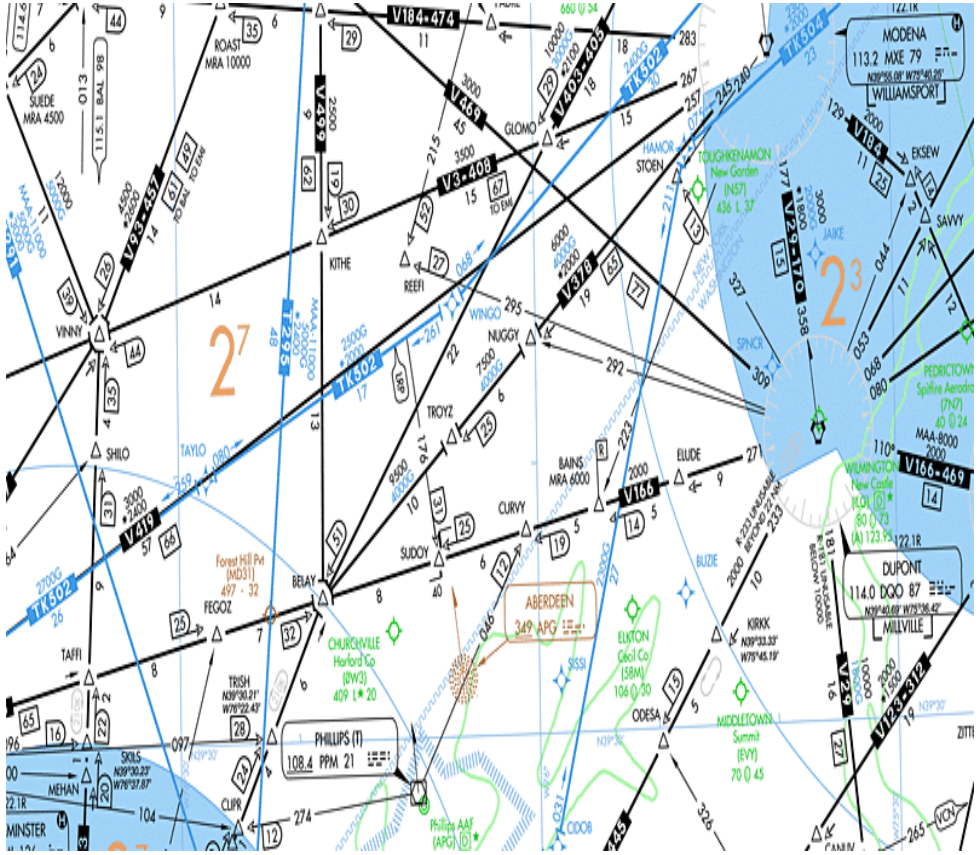
It must be made clear from the very beginning that the hazards identified for assessment here have been assessed and their risk(s) sufficiently mitigated to have permitted safe operation despite their presence. They are identified here for specificity and probability of further mitigation for the specific purpose of FRA implementation. Some of them had lent themselves to further mitigations, while SMS is satisfied with the indices of others. Therefore, the document is purely for assessment of identified hazards consequent upon implementation of FRA in the Nigerian airspace. It contains recommendations based on data submitted by Directorate of Operations and the FRA Project Manager.

THE APPROACH

- **The identification of States/ANSPs that have the capacity to implement free routing based on ATM systems infrastructure and capability.**
- **Develop the concept of operations and an implementation plan.**
- **Trial period before full implementation**

PURPOSE

The purpose of this exercise and this paper is to document the Safety Assessment of the Implementation of FRA within the Nigerian Airspace with the sole aim of showing stakeholders and reporting to the Nigerian Civil Aviation Authority (NCAA) that the safety risks associated with the implementation of this project have been evaluated by relevant statutory body under the guidance of competent and qualified personnel. It is also to demonstrate that appropriate mitigation actions have been applied where necessary, and that an acceptable level of safety has been created and shall be maintained in the implementation of the FRA in the Nigerian Airspace.



KANO FIR

Lagos Sub-FIR

LAGOS EAST

ACC Frequency

Pry – 127.3Mhz

Sec – 122.8 MHz

APP Frequency

Pry - 124.7 MHz

TWR Frequency

Pry – 118.1 MHz

3R-CWP/3R-ACWP/1S-WP/4P-CWP

LAGOS WEST

ACC Frequency

Pry – 120.9 MHz

Sec – 128.8 MHz

Kano Sub-FIR

KANO EAST

ACC Frequency

Pry - 124.1 MHz

APP Frequency

Pry - 125.7 MHz

TWR Frequency

Pry – 118.1 MHz

3R-CWP/3R-ACWP/1S-WP/4P-CWP

KANO WEST

ACC Frequency

Pry - 124.1 MHz

LIMITATIONS

CPDLC

- Poor ergonomics in the equipment layout,
- Low Pilot and aircraft capabilities and patronage especially in Lagos
- Sub-optimal ATCO competencies in operating the system.

POWER SUPPLY AND CNS SYSTEMS

- Public mains power supply facilitated by FAAN on behalf of the Local Distribution Company.
- Power generators, UPS Batteries and Solar Panels installed and maintained by NAMA.
- Procedures, Regulations and Instructions are contained in the LOAs, LATCI and ATM Manuals that require amendments
- Automation of flight planners, printers, etc. awaiting TRACON upgrade.
- Inadequate TRACON workstation floor space with no available VCCS

TRAFFIC FLOW PATTERN

PREDICTABILITY WITHIN THE FIR

- ***0600 – 1800 UTC*** **- High density east-bound traffic for departure, and west-bound traffic for arrival, comprising mainly domestic operations interspersed with some overflights.**

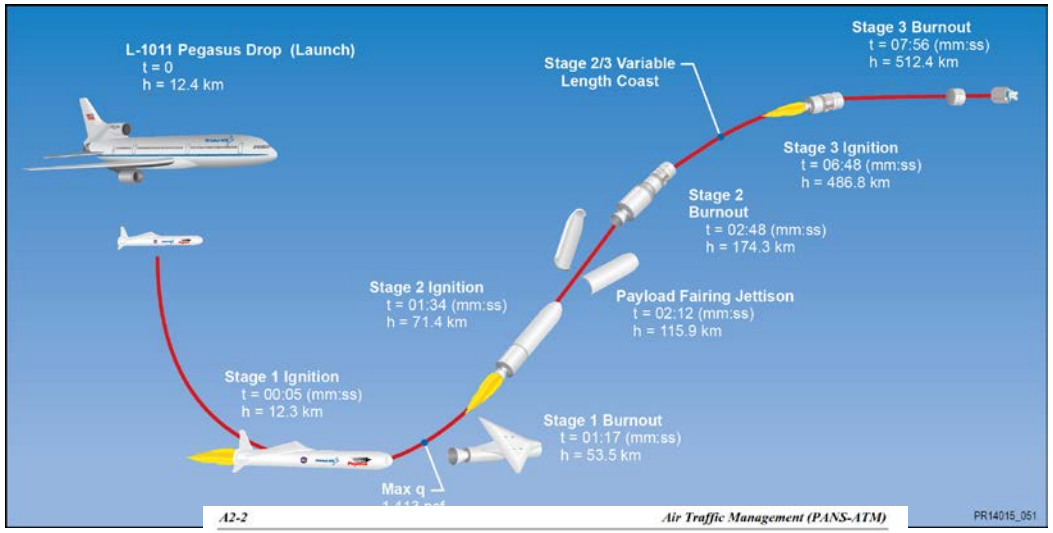
- **1800 – 0600 UTC - High density westbound overflight traffic controlled in Kano sub-FIR), and mixed-direction overflights traffic controlled by Lagos.**

CHARACTERISTICS OF FRA

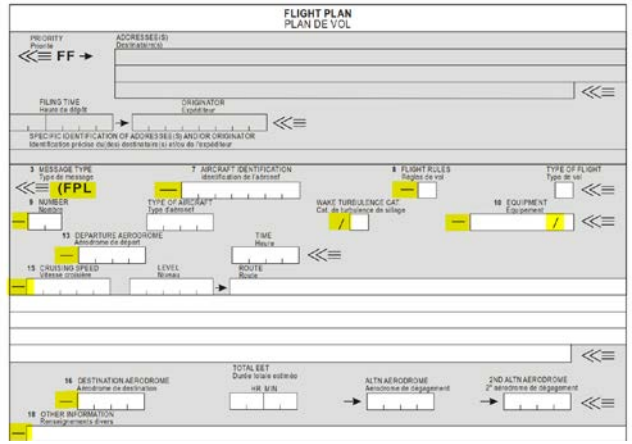
Free Route Airspace (FRA) ***is defined as an airspace within which users may freely plan a route from a defined entry point to a defined exit point (may require an intermediate significant point) subject to airspace availability.***

Characterized by;

- ✓ ***Preferred trajectory***
- ✓ ***Free flight plan routing***
- ✓ ***Direct Route Operations (DRO)***



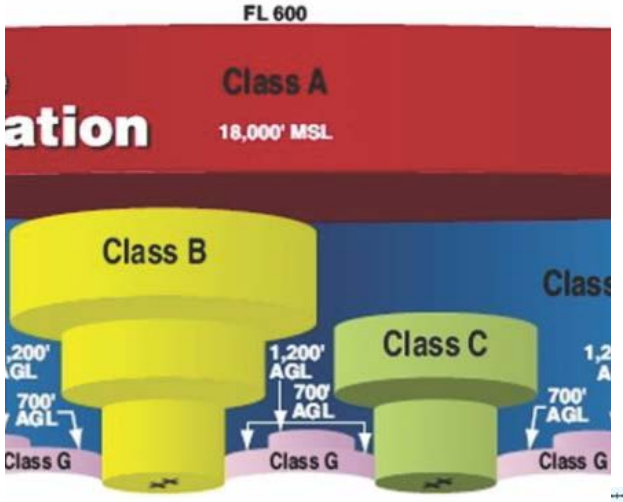
1. ICAO model flight plan form



CHARACTERISTICS OF FRA

Airspace Classification

- **Class A**
- **Application of Flight Level Orientation Scheme (FLOS)**



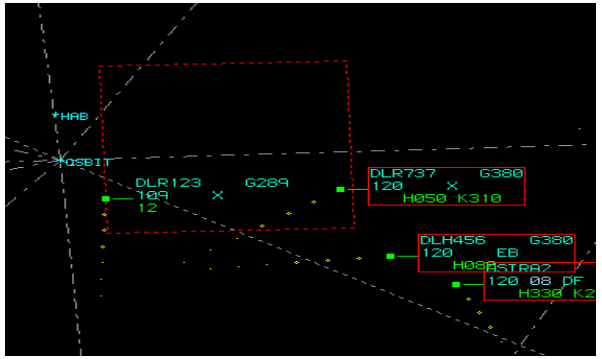
Airspace Organisation

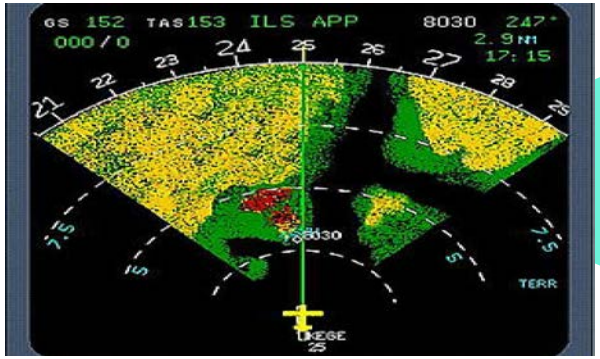
- **Civil/Military Cooperation**
- **Publication and maintenance of ATS Route Network eg. 5NLC**
- **No airspace sectorization restructure required**

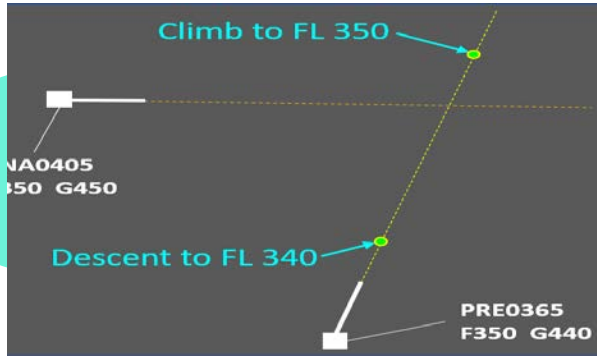
Trajectory Adherence

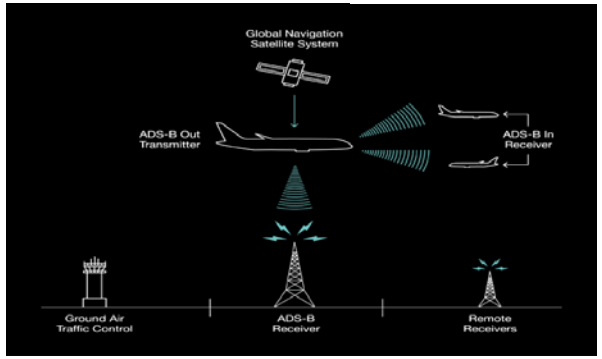
- **Enhanced Monitoring Aids (MONA) to support ATC service**

GROUND BASED AND AIRBORNE SAFETY NETS









STCA

SHORT TERM COLLISION ALERT

ground-based safety net intended to assist the controller in preventing collision between aircraft by generating, in a timely manner, an alert of a potential or actual infringement of separation minima

APW

AREA PROXIMITY WARNING

ground-based safety net intended to warn the controller about unauthorized penetration of an airspace volume by generating, in a timely manner, an alert of a potential or actual infringement of the required spacing to that airspace volume, which require attention/action.

CD/R

CONFLICT DETECTION AND RESOLUTION

tools that provide automated assistance to the Planning Controllers (PC), as well as Tactical Controllers (TC).

MONA

MONITORING AIDS

helps controllers to reduce the workload associated with traffic monitoring tasks by providing warnings if aircraft deviate from a clearance or plan and reminders of instructions to be issued and providing conformance monitoring triggering trajectory recalculation essential for the CDT

FRA SIGNIFICANT POINTS

E - ENTRY POINT

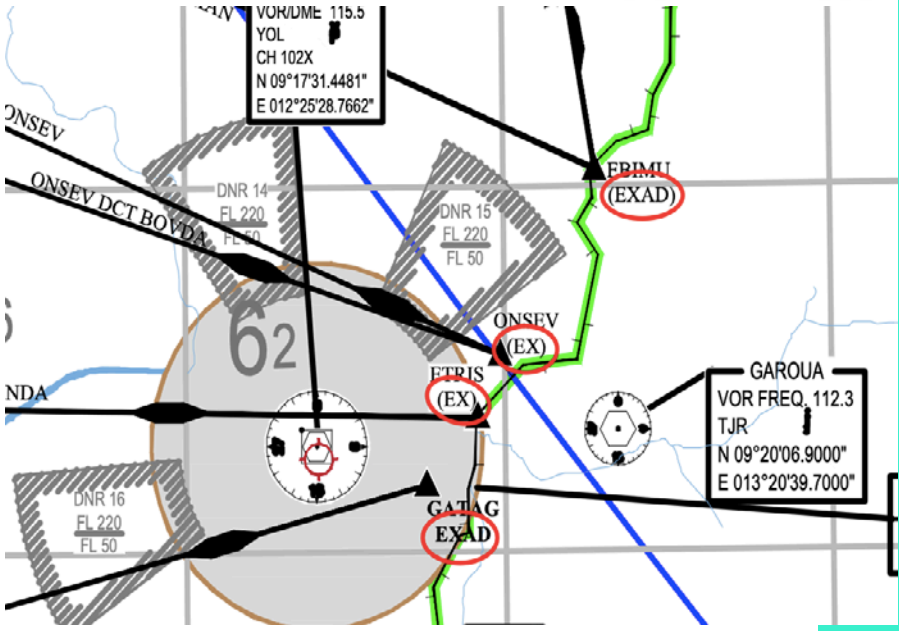
X - EXIT POINT

I - INTERMEDIATE POINT

EX - ENTRY/EXIT POINT

AD - ARRIVAL CONNECTION POINT

EXAD - ENTRY/EXIT/ARRIVAL/DEPARTURE



AI - ARRIVAL CONNECTION/INTERMEDIATE CONNECTION

BI-DIRECTIONAL -

UNI- DIRECTIONAL -

GENERAL PROCEDURES (FRA – LOCAL)

APPLICABILITY

Nigeria (Kano FIR) is implementing FRA between Latitudes **3°** and **14°** north to be mainly used by overflying Traffic**.**

AIRSPACE CLASSIFICATION

Nigeria (Kano FIR) FRA is classified as class A Airspace

LATERAL LIMITS

The Nigeria (Kano FIR) FRA characteristics are described in Appendix 3 of the Nigeria AIP.

VERTICAL LIMITS

FL 245 / UNL

TIME OF AVAILABILITY

H24

SEPARATION MINIMA

No change in enroute separation minima required

SEPARATION MINIMA

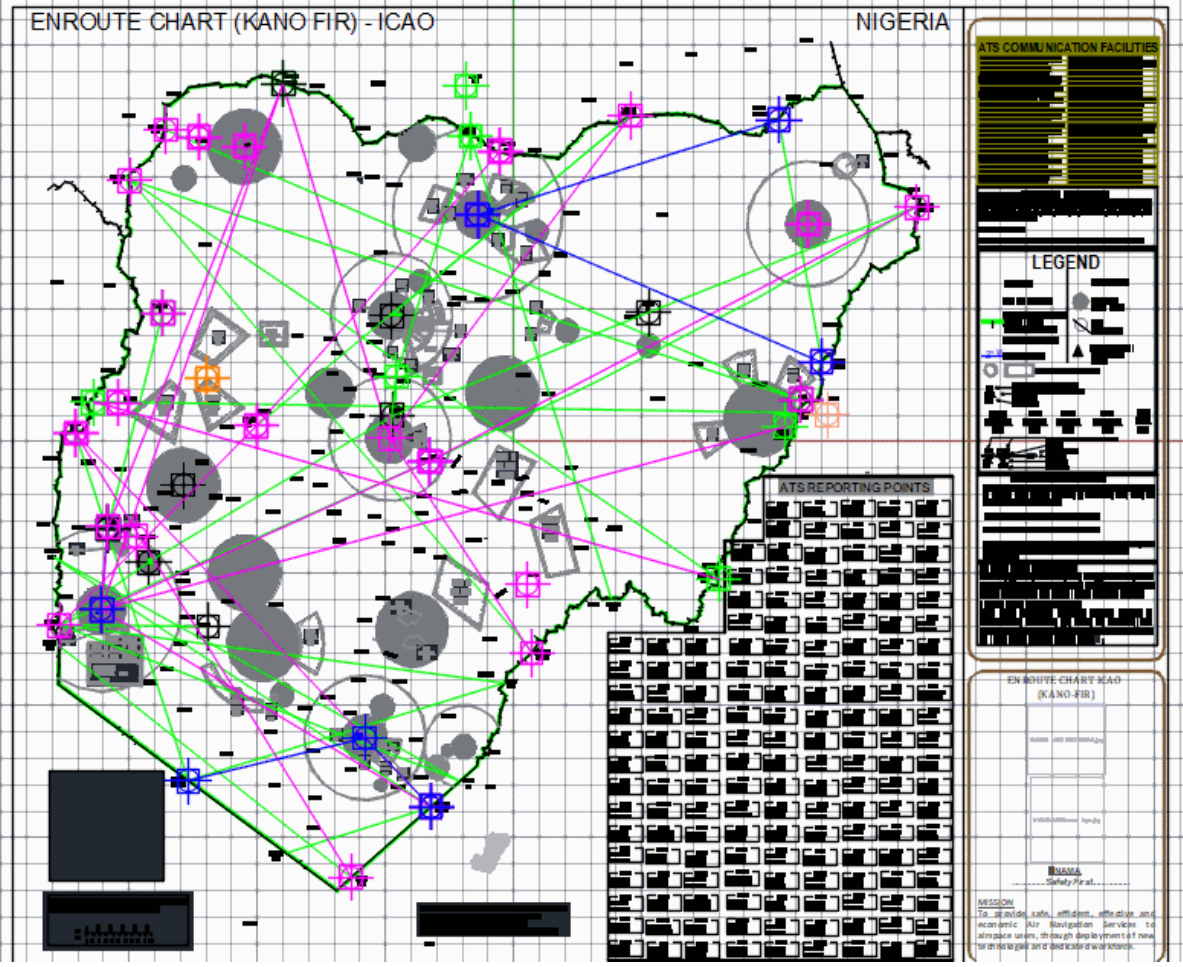
No change in En-Route separation minima (i.e. Vertical and horizontal separation minima based on ATS surveillance) is needed in relation to Free Route operations. Separation minima between aircraft are expected to continue to be based on guidance, regulations, and factors used in today's environment (ICAO Doc 4444 Procedures for Air Traffic Management). Differences from DOC 4444 standards (if any) are to be published in AIP

FRA ATM CONTINGENCY

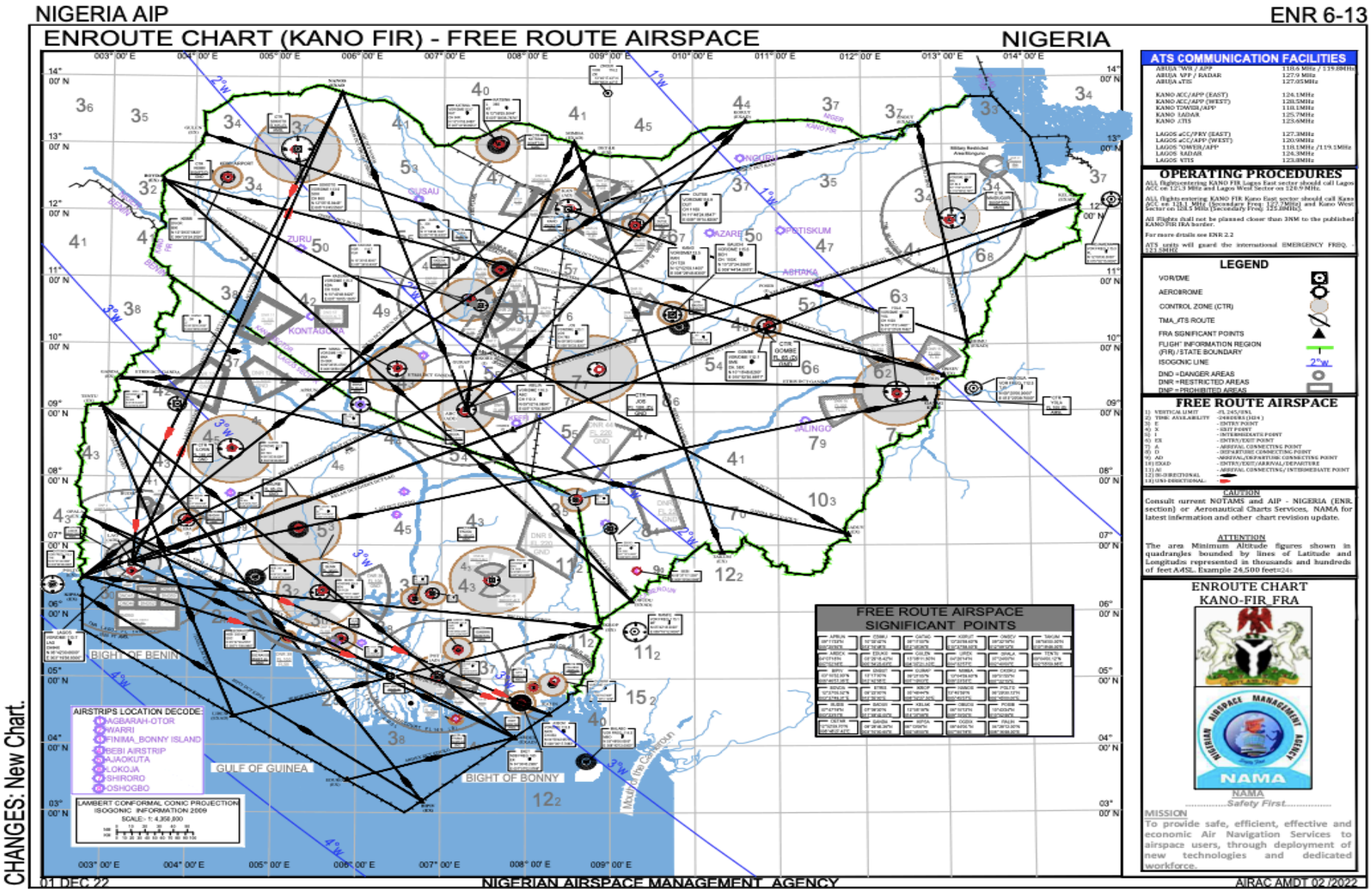
Free Route Airspace shall be available for flight planning and operations within the Kano FIR, except under the following conditions;

- In the event of total failure of surveillance system (Radar and ADS-C / CPDLC).
- In the event of total or partial failure of communication system within the designated Free Route Airspace or portion thereof.
- In the event of severe weather conditions that may not permit flight over direct route as planned.
- During ATM contingency that may affect the safety and efficiency of flight operations on such Direct Routes.

FLIGHT PLANNABLE DIRECT ROUTES IN FRA – LOCAL IN KANO FIR USING PHX SOFTWARE



37 PUBLISHED FREE ROUTE AIRSPACE - LOCAL



SAFETY RISK MANAGEMENT

HAZARD IDENTIFICATION

TYPE OF OPERATIONS:

Air Traffic Management (ATM)

GENERIC HAZARD:

FRA Implementation

ATM (Airspace Reorganisation)

SPECIFIC COMPONENTS OF HAZARD:

- Loss of situational awareness by ATCO.
- Aircraft crossing the length and breadth of the Nigerian airspace on an unusual trajectory.
- Inter-FIR route traffic conflict because of aircraft maneuvers to avoid widespread weather.
- RCF/poor readability involving one aircraft in one sub-FIR while entering into another sector.
- Uneven ATCO competencies operating in the different Sub FIR.
- Convergence of traffic from the two different sectors at an exit point adjacent to neighboring FIR
- Failure/lack of coordination between Lagos and Kano ACC
- Inadequate trained manpower
- High ATCO Workload / Reduction of Separation (AIRPROX)

SAFETY RISK MANAGEMENT

HAZARD IDENTIFICATION

HARZARD RELATED CONSEQUENCES:

- Collision avoidance maneuver
- Level Burst and inability to maintain level
- Substantial damage to aircraft hull
- Injuries to passengers
- Mid-Air collision
- Death of crew and passengers
- Damage to State, ANSP and Airlines reputations
- Bankruptcy due payment of huge reparation

EXISTING DEFENCES:

- Development of Standard Operating Procedure (SOP)
- Conduct of preliminary FRA Gap Analysis – Annex 2
- Issuance of AIP Supplement (AIRAC AIP SUP – AS08/2021 – Publication date – 21st Oct. 2021, with Effective implementation date of 2nd December 2021, three months prior to initial FRA Local implementation
- Conduct of physical and virtual training/sensitization workshop/seminar on implementation
- Update of radar maps and charts
- Enhanced ATC Coordination procedures
- Availability of reliable and rapid inter-unit coordination systems.
- Identification and tagging of flash points of traffic conflict, especially at route intersections.
- Continual monitoring and reporting shortcomings of implementation lapses.
- Availability of high integrity radio communication system.
- Availability of high integrity surveillance coverage of the entire sectors and safety nets.
- Adequate contingency procedures for transiting from Surveillance to Procedural Control
- Availability of adequate manpower for seamless implementation of FRA – Local.

SAFETY RECOMMENDATIONS

The FRA implementation is still work in progress for Nigeria

Undergoing continuous monitoring

Ongoing observations and reviews

Need for a new SRA

SAFETY DEFENSES

- Technology
- Training
- Regulations

19 KANO FIR EQUIPMENT QUESTIONAIRE FOR FRA – LOCAL IMPLEMENTATION

RISK CONTROL/MITIGATION QUESTION	RESPONSE	ADDITIONAL DEFENCES REQUIRED
Are the CNS systems that will support the required prompt and reliable coordination available?	Yes, but has recorded intermittent hitches recently that are handled by the reconditioning.	Power supply has been identified as the source of failure. Work is almost completed for rectifying it.
Is the manpower requirement sufficient to service the intended operation?	Yes, meets minimum requirement, but need improvement.	Plan for more trained ATCOs posting presented and approved.
Do the CNS systems required for effective coordination function as required?	Yes, had been made better through upgrade.	Surveillance reliability and integrity are also increased through upgrade.
Are the CNS systems defenses practical for use under working conditions?	Yes	Minimize system failure rate, and reduce average down time through upgrade
Are staff involved aware of the safety risks of the consequences of the hazards, and the defenses in place?	Yes, through training and unit briefing.	Iterate the briefing and review training requirements whenever necessary. Communicate safety risk assessment to operation staff
Are additional safety risks mitigation/control measures required?	Yes. Make available electronic flight progress strip for ATCOS	Review ATC procedures to make for reduction of controllers' workload.
Are procedures on ground to accommodate trainee ATCOS in FRA – Local operations	Yes, under supervision	Entrench increased supervision of trainees to forestall unsafe acts and breakdown of separations
Are procedures on ground to brief operational staff on the progress recorded in the FRA implementation	No	Institute procedures for communication of progress made in the implementation of FRA – Local including sharing statistical data.

Kano FRA Equipment Questionnaire (FRA-Local)

Risk Control/Mitigation Question

↓

Response

↓

Additional Defenses Required

FRA GAP ANALYSIS CHECK LIST
ANNEX 2

THEME	QUERY	REMARKS
▪ Airspace Structure	?	.....
▪ Communication Capabilities		.....
▪ Survellance Capabilities		.....
▪ Ground-based safety nets		.....
▪ Conflict detection and Resolution Tools		.....
▪ Systems Supported by Coordination		.....
▪ Flight Planning Process		.....
▪ Navigation Infrastructre		.....
▪ Contingency		.....
▪ Training		.....

Theme	Query	Remarks
Airspace Structure	**Which practices are currently in place within your FIR?** ☒ Fixed ATS Route Network (ARN) ☒ Published Direct Routing Operations (DRO) ☐ Unpublished direct segments ☒ Free Routing Airspace (FRA)	**All Air Routes within Kano FIR are published in the Nigeria AIP**
Communication capabilities	**Which Air/Ground communication capabilities do you have?** Please specify the communication capabilities you have ☒ VHF Transaction time in sec: Availability in %: **100** Continuity in %: **100** Integrity in %: **97** ☒ CPDLC Transaction time in sec: Availability in %: **80** Continuity in %: **80** Integrity in %: **95** ☒ HF Transaction time in sec: Availability in %: **100** Continuity in %: **100** Integrity in %: **100** Others.....	

SAFETY RISK ASSESSMENT OF FREE ROUTE AIRSPACE – LOCAL IMPLEMENTATION IN NIGERIA

Type of Operations	Generic Hazards	Specific components of the Hazard	Hazard Related Consequences	Exiting Defenses to Control Risk(s) and Risk Index	Further Actions to Reduce Risk(s) and Resulting Index
Operations (Air Traffic Management)	FRA	1. Extreme and marginal weather condition. 2. Partial or complete RAADAR failure	1.Level burst/ inability to maintain level due turbulence, 2.Death and/or injury of Passengers and crew, haul loss or damage to aircraft	1. Conduct of preliminary FRA Gap analysis – Annex 2 2. Issuance of appropriate AIP Supplements 3. Updating of LOAs, LOPs and LATCIs	1. Conduct of more robust FRA Gap analysis – Annex 2 2. Obtain 5NLC for an un-named intermediate waypoint "OGDIX".

SAFETY RISK ASSESSMENT OF FREE ROUTE AIRSPACE – LOCAL IMPLEMENTATION IN NIGERIA (Cont'd)

Type of Operations	Generic Hazards	Specific components of the Hazard	Hazard Related Consequences	Exiting Defenses to Control Risk(s) and Risk Index	Further Actions to Reduce Risk(s) and Resulting Index
Operations (Air Traffic Management)	FRA	3.RCF/Poor readability of radio frequency, 4.Loss of situation awareness, 5.Inadequately trained manpower in FRA Local procedures.	3. Damage to State, ANSP or Airlines' reputations. 4. Bankruptcy due high payment of reparations.	. Nigeria Airspace Route Chart/Navigation Chart 5. Radar map Update of Intermediate Waypoints. 6.Training/sensitization workshop for ATCOS and AIS personnel	3. Conduct of additional Training/sensitization workshop for ATCOS and AIS personnel 4. Installation of High-Integrity air-ground radio equipment. 5. RADAR upgrade.

SAFETY RISK ASSESSMENT OF FREE ROUTE AIRSPACE – LOCAL IMPLEMENTATION IN NIGERIA (Cont'd)

Type of Operations	Generic Hazards	Specific components of the Hazard	Hazard Related Consequences	Exiting Defenses to Control Risk(s) and Risk Index	Further Actions to Reduce Risk(s) and Resulting Index
Operations (Air Traffic Management)	FRA			8. Enhanced co-ordination procedures 9. Safety nets on radar 10. High integrity radio communication 11. Operational posting of ATCOS for adequate manpower	
				Risk Index: 2D	Resultant Risk Index: 1D

HAZARD ASSESSMENT

S/N	Hazard ID	Hazard Description	Resultant Risk Index
1.	ATM/OPS 01	Radio Communication Failure	2D
2.	ATM/OPS 02	Surveillance Equipment Failure (Full or Partial)	2E
3.	ATM/OPS 03	Failure/lack of coordination between Lagos and Kano	3D
4.	ATM/OPS 04	Failure of VSAT and Satellite Systems	2E
5.	ATM/OPS 07	Inadequate ATCO Training for FRA	1B
6.	ATM/OPS 06	Power Failure	1B

ICAO RISK ANALYSIS MATRIX

Severity / Probability	Catastrophic A	Hazardous B	Major C	Minor D	Negligible E
Frequent 5	5A	5B	5C	5D	5E
Occasional 4	4A	4B	4C	4D	4E
Remote 3	3A	3B	3C	3D	3E
Improbable 2	2A	2B	2C	2D	2E
Extremely Improbable 1	1A	1B	1C	1D	1E

Fig.1: Risk Assessment Analysis Matrix Source: NAMA SMS Manual

Unacceptable Risk
Acceptable with Mitigation
Acceptable Risk

Fig. 2: Legend to the Risk Analysis Matrix

SAFETY RISK PROBABILITY

Likelihood	Meaning	Value
FREQUENT	Likely to occur many times (has occurred frequently)	**5**
OCCASIONAL	Likely to occur sometimes (has occurred infrequently)	**4**
REMOTE	Unlikely, but possible to occur (has occurred rarely)	**3**
IMPROBABLE	Very unlikely to occur (not known to have occurred)	**2**
EXTREMELY IMPROBABLE	Almost inconceivable that the Event will occur	**1**

Table 2: ICAO Safety Risk Probability Table

SAFETY RISK SEVERITY

Severity	Meaning	Value
CATASTROPHIC	- Equipment Destroyed - Multiple Deaths	**A**
HAZARDOUS	- A large reduction in safety margins, physical distress or a workload such that the operators cannot be relied upon to perform their tasks accurately or completely. - Serious injury - Major Equipment Damage	**B**
MAJOR	- A significant Reduction in safety margins, a reduction in the ability of the operators to cope with adverse operating conditions because of an increase in workload or because of conditions impairing their efficiency - Serious incident - Injury to persons	**C**
MINOR	- Nuisance - Operating limitations - Use of emergency procedures - Minor incidents	**D**
NEGLIGIBLE	- Few consequences	**E**

Table 3: ICAO Risk Severity Table

Source: NAMA SMS Manual

ATC Environment of SAFETY RISK SEVERITY

Catastrophic – **A**	**Hazardous –** **B**	**Major –** **C**	**Minor –** **D**	**Negligible –** **E**
Collision with other aircraft, obstacles, or terrain.	Reduction in separation as defined by a high severity operational error, or a total loss of ATC.	Reduction in separation as defined by a low/moderate severity operational error, or significant reduction in ATC capability.	Slight reduction in ATC capability, or significant increase in ATC workload.	Slight increase in ATC workload.

Table 4: Example of risk severity using ATC environment Source: NAMA SMS Manual

HAZARD REGISTER for FRA SRA

(Radio Communication Failure)

NIGERIAN AIRSPACE MANAGEMENT AGENCY (NAMA)		
Hazard ID: ATM/OPS 01	**Project**: Free Route Airspace	**Date**: 09/02/23
Hazard Description: Radio Communication Failure		
Risk Probability: Improbable	**Severity**: Minor	Risk Index: 2D
Hazard Related Consequences: Loss of separation Increased ATCO workload	**Existing Defenses**: ATCO training CPDLC Secondary radio frequency Route Design Contingency Procedures	
Further Mitigation (If required): Radar upgrade ATCO Training ATCO refresher Mode S (On-going) Integration of PSR, SSR and ADS-C (on-going)		
Resultant Risk Probability: Improbable	**Resultant Severity**: Negligible	**Resultant Risk Index**: 2E
Mitigation By:	Director of Operations and Director of Engineering	
Date Completed:	November, 2022	

Type of Operation	Generic Hazard	Specific component of Hazard	Hazard Related Consequence	Existing Defences	Risk Index	Further Actions	Resultant Index
ATM	Free Route Airspace	Radio Communication failure (ATM/OPS 01)	Loss of separation Increased ATCO workload	ATCO trained CPDLC Provision of redundancies SLOP Airways design Contingency procedure	2D	Installation of high integrity radio More ATCO training	2E
		Surveillance Equipment Failure (full or Partial) (ATM/OPS02)	Loss of separation Increased ATCO workload Fall-back to procedural control Loss of situation awareness Congestion and increased fuel burn Height deviation and level burst undetected	Back up radar Contingency Procedures Trained ATCOS SLOP ADS-C	2D	Radar upgrade Mode S Integration of PSR, SSR and ADS-C	2E
		Failure/lack of coordination between Lagos and Kano (ATM/OPS03)	Increased ATCOS workload Loss of separation Delayed Aircraft Movement Loss of situation awareness	Enhanced Coordination Procedures CPDLC Installation of Telephones	2D	Safety Nets ATCOS Refresher ATCO Supervisors Training	2E
		Failure of VSAT and satellite systems (ATM/OPS04)	Long-range RT failure Loss of separation Loss of connectivity of radar system Increased ATCOS workload	Contingency Procedures ATCOS Training SLOP	2D	VSAT Redundancies Solar power IDU7000	2E
		Inadequate ATCO Training for FRA (ATM/OPS07)	ATCO workload AIRPROX Air Traffic Congestion	ATCO Training Contingency Procedure FRA Manager workshop	2C	More ATCO Training Update of radar map FRA Charts	2D
			Radar failure	Public power		Replacement	

FIG: FRA Safety Risk Analysis

HAZARD REGISTER for FRA SRA

(Surveillance Equipment Failure – Partial or Total)

NIGERIAN AIRSPACE MANAGEMENT AGENCY (NAMA)		
Hazard ID: ATM/OPS 02	**Project**: Free Route Airspace	**Date**: 09/02/23
Hazard Description: Surveillance equipment Failure (full or partial)		
Risk Probability: Improbable	**Severity**: Minor	Risk Index: 2D
Hazard Related Consequences: Loss of separation Increased ATCO workload Congestion and increased fuel burn Loss of situation awareness Revert to procedural control	**Existing Defenses**: Back-up radar ATCO training ADS-C SLOP Route Design Contingency Procedures	
Further Mitigation (If required): Installation of high integrity radio Additional ATCO training		
Resultant Risk Probability: Improbable	**Resultant Severity**: Negligible	**Resultant Risk Index**: 2E
Mitigation By:	Director of Operations and Director of Engineering	
Date Completed:	June, 2022	

Type of Operation	Generic Hazard	Specific component of Hazard	Hazard Related Consequence	Existing Defences	Risk Index	Further Actions	Resultant Index
ATM	Free Route Airspace	Radio Communication failure (ATM/OPS 01)	Loss of separation Increased ATCO workload	ATCO trained CPDLC Provision of redundancies SLOP Airways design Contingency procedure	2D	Installation of high integrity radio More ATCO training	2E
		Surveillance Equipment Failure (full or Partial) (ATM/OPS02)	Loss of separation Increased ATCO workload Fall-back to procedural control Loss of situation awareness Congestion and increased fuel burn Height deviation and level burst undetected	Back up radar Contingency Procedures Trained ATCOS SLOP ADS-C	2D	Radar upgrade Mode S Integration of PSR, SSR and ADS-C	2E
		Failure/lack of coordination between Lagos and Kano (ATM/OPS03)	Increased ATCOS workload Loss of separation Delayed Aircraft Movement Loss of situation awareness	Enhanced Coordination Procedures CPDLC Installation of Telephones	2D	Safety Nets ATCOS Refresher ATCO Supervisors Training	2E
		Failure of VSAT and satellite systems (ATM/OPS04)	Long-range RT failure Loss of separation Loss of connectivity of radar system Increased ATCOS workload	Contingency Procedures ATCOS Training SLOP	2D	VSAT Redundancies Solar power IDU7000	2E
		Inadequate ATCO Training for FRA (ATM/OPS07)	ATCO workload AIRPROX Air Traffic Congestion	ATCO Training Contingency Procedure FRA Manager workshop	2C	More ATCO Training Update of radar map FRA Charts	2D
			Radar failure	Public power		Replacement	

FIG: FRA Safety Risk Analysis

HAZARD REGISTER for FRA SRA

(Failure/Lack of Coordination between Lagos and Kano)

NIGERIAN AIRSPACE MANAGEMENT AGENCY (NAMA)		
Hazard ID: ATM/OPS 03	**Project**: Free Route Airspace	**Date**: 09/02/23
Hazard Description: Failure or lack of coordination between Lagos and Kano ACC		
Risk Probability: Improbable	**Severity**: Minor	Risk Index: 2D
Hazard Related Consequences: Loss of separation Increased ATCO workload Congestion and increased fuel burn Loss of situation awareness Delayed aircraft movement	**Existing Defenses:** Enhanced coordination procedures ATCO training CPDLC Installation of telephones Contingency Procedures	
Further Mitigation (If required): Safety Nets ATCO Refresher ATCO Supervisor training		
Resultant Risk Probability: Improbable	**Resultant Severity**: Negligible	**Resultant Risk Index**: 2E
Mitigation By:	Director of Operations	
Date Completed:	May, 2022	

Type of Operation	Generic Hazard	Specific component of Hazard	Hazard Related Consequence	Existing Defences	Risk Index	Further Actions	Resultant Index
ATM	Free Route Airspace	Radio Communication failure (ATM/OPS 01)	Loss of separation Increased ATCO workload	ATCO trained CPDLC Provision of redundancies SLOP Airways design Contingency procedure	2D	Installation of high integrity radio More ATCO training	2E
		Surveillance Equipment Failure (full or Partial) (ATM/OPS02)	Loss of separation Increased ATCO workload Fall-back to procedural control Loss of situation awareness Congestion and increased fuel burn Height deviation and level burst undetected	Back up radar Contingency Procedures Trained ATCOS SLOP ADS-C	2D	Radar upgrade Mode S Integration of PSR, SSR and ADS-C	2E
		Failure/lack of coordination between Lagos and Kano (ATM/OPS03)	Increased ATCOS workload Loss of separation Delayed Aircraft Movement Loss of situation awareness	Enhanced Coordination Procedures CPDLC Installation of Telephones	2D	Safety Nets ATCOS Refresher ATCO Supervisors Training	2E
		Failure of VSAT and satellite systems (ATM/OPS04)	Long-range RT failure Loss of separation Loss of connectivity of radar system Increased ATCOS workload	Contingency Procedures ATCOS Training SLOP	2D	VSAT Redundancies Solar power IDU7000	2E
		Inadequate ATCO Training for FRA (ATM/OPS07)	ATCO workload AIRPROX Air Traffic Congestion	ATCO Training Contingency Procedure FRA Manager workshop	2C	More ATCO Training Update of radar map FRA Charts	2D
			Radar failure	[redacted]		Replacement	

FIG: FRA Safety Risk Analysis

HAZARD REGISTER for FRA SRA

(VSAT and Satelite System Failure)

NIGERIAN AIRSPACE MANAGEMENT AGENCY (NAMA)		
Hazard ID: ATM/OPS 04	**Project**: Free Route Airspace	**Date**: 09/02/23
Hazard Description: Failure of VSAT and Satellite System		
Risk Probability: Improbable	**Severity**: Minor	Risk Index: 2D
Hazard Related Consequences: Loss of separation Loss of radar connectivity Increased ATCO workload	**Existing Defenses**: Contingencies ATCO Training SLOP	
Further Mitigation (If required): Upgrade to IDU7000 VSAT Redundancies Solar power system (Additional on-going)		
Resultant Risk Probability: Improbable	**Resultant Severity**: Negligible	**Resultant Risk Index**: 2E
Mitigation By:	Director of Operations	
Date Completed:	May, 2022	

Type of Operation	Generic Hazard	Specific component of Hazard	Hazard Related Consequence	Existing Defences	Risk Index	Further Actions	Resultant Index
ATM	Free Route Airspace	Radio Communication failure (ATM/OPS 01)	Loss of separation Increased ATCO workload	ATCO trained CPDLC Provision of redundancies SLOP Airways design Contingency procedure	2D	Installation of high integrity radio More ATCO training	2E
		Surveillance Equipment Failure (full or Partial) (ATM/OPS02)	Loss of separation Increased ATCO workload Fall-back to procedural control Loss of situation awareness Congestion and increased fuel burn Height deviation and level burst undetected	Back up radar Contingency Procedures Trained ATCOS SLOP ADS-C	2D	Radar upgrade Mode S Integration of PSR, SSR and ADS-C	2E
		Failure/lack of coordination between Lagos and Kano (ATM/OPS03)	Increased ATCOS workload Loss of separation Delayed Aircraft Movement Loss of situation awareness	Enhanced Coordination Procedures CPDLC Installation of Telephones	2D	Safety Nets ATCOS Refresher ATCO Supervisors Training	2E
		Failure of VSAT and satellite systems (ATM/OPS04)	Long-range RT failure Loss of separation Loss of connectivity of radar system Increased ATCOS workload	Contingency Procedures ATCOS Training SLOP	2D	VSAT Redundancies Solar power IDU7000	2E
		Inadequate ATCO Training for FRA (ATM/OPS07)	ATCO workload AIRPROX Air Traffic Congestion	ATCO Training Contingency Procedure FRA Manager workshop	2C	More ATCO Training Update of radar map FRA Charts	2D
			Radar failure	[redacted]		Replacement	

FIG: FRA Safety Risk Analysis

HAZARD REGISTER for FRA SRA

(Inadequate ATCO Training for FRA)

NIGERIAN AIRSPACE MANAGEMENT AGENCY (NAMA)		
Hazard ID: ATM/OPS 07	**Project**: Free Route Airspace	**Date**: 09/02/23
Hazard Description: Inadequate ATCO Training for FRA		
Risk Probability: Improbable	**Severity**: Major	Risk Index: 2C
Hazard Related Consequences: ATCO workload AIRPROX Congestion	**Existing Defenses:** Contingency Procedure ATCO Training FRA Manager Workshop	
Further Mitigation (If required): More ATCO Training Update of radar map FRA Charts 5NLC for waypoint		
Resultant Risk Probability: Improbable	**Resultant Severity**: Minor	**Resultant Risk Index**: 2D
Mitigation By:	Director of Operations	
Date Completed:	May, 2022	

Type of Operation	Generic Hazard	Specific component of Hazard	Hazard Related Consequence	Existing Defences	Risk Index	Further Actions	Resultant Index
ATM	Free Route Airspace	Radio Communication failure (ATM/OPS 01)	Loss of separation Increased ATCO workload	ATCO trained CPDLC Provision of redundancies SLOP Airways design Contingency procedure	2D	Installation of high integrity radio More ATCO training	2E
		Surveillance Equipment Failure (full or Partial) (ATM/OPS02)	Loss of separation Increased ATCO workload Fall-back to procedural control Loss of situation awareness Congestion and increased fuel burn Height deviation and level burst undetected	Back up radar Contingency Procedures Trained ATCOS SLOP ADS-C	2D	Radar upgrade Mode S Integration of PSR, SSR and ADS-C	2E
		Failure/lack of coordination between Lagos and Kano (ATM/OPS03)	Increased ATCOS workload Loss of separation Delayed Aircraft Movement Loss of situation awareness	Enhanced Coordination Procedures CPDLC Installation of Telephones	2D	Safety Nets ATCOS Refresher ATCO Supervisors Training	2E
		Failure of VSAT and satellite systems (ATM/OPS04)	Long-range RT failure Loss of separation Loss of connectivity of radar system Increased ATCOS workload	Contingency Procedures ATCOS Training SLOP	2D	VSAT Redundancies Solar power IDU7000	2E
		Inadequate ATCO Training for FRA (ATM/OPS07)	ATCO workload AIRPROX Air Traffic Congestion	ATCO Training Contingency Procedure FRA Manager workshop	2C	More ATCO Training Update of radar map FRA Charts	2D
			Radar failure	Public power		Replacement	

FIG: FRA Safety Risk Analysis

HAZARD REGISTER for FRA SRA

(Power Failure - Partial or Total)

NIGERIAN AIRSPACE MANAGEMENT AGENCY (NAMA)		
Hazard ID: ATM/OPS 06	**Project**: Free Route Airspace	**Date**: 09/02;23
Hazard Description: Power Failure (Partial or total)		
Risk Probability: Improbable	**Severity**: Major	**Risk Index**: 3D
Hazard Related Consequences: Radar Failure Radio outage AIPROX Loss of separation	**Existing Defenses**: Contingency Procedures Public power supply Generator Batteries Solar power system	
Further Mitigation (If required): Replacement of old generators Installation of additional solar power system Additional redundancies		
Resultant Risk Probability: Improbable	**Resultant Severity**: Minor	**Resultant Risk Index**: 2D
Mitigation By:	Director of Operations	
Date Completed:	May, 2022	

Type of Operation	Generic Hazard	Specific component of Hazard	Hazard Related Consequence	Existing Defences	Risk Index	Further Actions	Resultant Index
ATM	Free Route Airspace	Radio Communication failure (ATM/OPS 01)	Loss of separation Increased ATCO workload	ATCO trained CPDLC Provision of redundancies SLOP Airways design Contingency procedure	2D	Installation of high integrity radio More ATCO training	2E
		Surveillance Equipment Failure (full or Partial) (ATM/OPS02)	Loss of separation Increased ATCO workload Fall-back to procedural control Loss of situation awareness Congestion and increased fuel burn Height deviation and level burst undetected	Back up radar Contingency Procedures Trained ATCOS SLOP ADS-C	2D	Radar upgrade Mode S Integration of PSR, SSR and ADS-C	2E
		Failure/lack of coordination between Lagos and Kano (ATM/OPS03)	Increased ATCOS workload Loss of separation Delayed Aircraft Movement Loss of situation awareness	Enhanced Coordination Procedures CPDLC Installation of Telephones	2D	Safety Nets ATCOS Refresher ATCO Supervisors Training	2E
		Failure of VSAT and satellite systems (ATM/OPS04)	Long-range RT failure Loss of separation Loss of connectivity of radar system Increased ATCOS workload	Contingency Procedures ATCOS Training SLOP	2D	VSAT Redundancies Solar power IDU7000	2E
		Inadequate ATCO Training for FRA (ATM/OPS07)	ATCO workload AIRPROX Air Traffic Congestion	ATCO Training Contingency Procedure FRA Manager workshop	2C	More ATCO Training Update of radar map FRA Charts	2D
			Radar failure	Public power		Replacement	

FIG: FRA Safety Risk Analysis

FURTHER ACTIONS

RISK INDEX

2D

- ✓ *Obtaining 5NLC from ICAO WACAF for an un-named 'Intermediate' waypoint (OGDIX) causing loss of situation awareness and update on radar map.*
- ✓ *Conduct of more robust FRA Gap Analysis – Annex 2 – more parameters were analyzed*
- ✓ ***Conduct of additional training/sensitization workshop for ATCOS and AIS personnel***
- ✓ *Installation of high-Integrity digital radio equipment for long range Air-ground communication*
- ✓ *Commencement of TRACON Recondition project pending upgrade*

RESULTANT RISK INDEX

1D

Hazard Identification and Risk Management (HIRM) Log can be found in Appendix 1 to this SRA

FRA INCREMENTS BASED ON ENHANCED SAFETY RISK INDEX – *1 D*

Implementation of FRA – Local first phase increment –

FIRST PHASE INCREMENT AS10/2022 effective date 19th May 2022 with attendant ATM procedures and notified all stakeholders appropriately

Implementation of FRA – Local first phase increment –

FIRST PHASE INCREMENT AS10/2022 effective date 19th May 2022 with attendant ATM procedures and notified all stakeholders appropriately

CONCLUSION

After very careful considerations of the six (6) hazards associated with the implementation of FRA – Local in the Nigerian airspace, it was assessed that all were within acceptable zones of safety risk, with the current conclusions being;

RISK INDEX – ***2D***

RESULTANT RISK INDEX: ***1D***

This therefore implies that risk(s) posed by the identified hazards have been sufficiently mitigated to pose no safety risk to the implementation of FRA – Local operations in the Kano FIR.

It is therefore the considered opinion of NAMA SMS that the free route airspace – Local is safe for implementation in the Nigerian airspace (Kano FIR) based on the data provided by the Directorate of Operations and the FRA Project Manager.

THANK YOU

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