Operational Benefits of the Implementation of Free Route Airspace in Kano Flight Information Region (Nigeria)

Oyetoun Foluwake Adegbesan (Nigeria Civil Aviation Authority), and Samson O. Akpore (Nigerian Airspace Management Agency)

Introduction

Nigeria has implemented various measures for the mitigation of CO_2 emissions in its efforts to contribute to the global targets set by ICAO. These measures and initiatives, which include improvement of airport operations and infrastructure, air navigation facilities and air traffic management system, and the acquisition of more fuel-efficient aircraft by Nigerian operators, etc. are all detailed in the updated State Action Plan (SAP) submitted by Nigeria to ICAO in November 2024.

As a key component of State Action Plans, the mitigation measures reflect the ongoing mitigation efforts, and in Nigeria's SAP it includes measures in areas such as modernization of fleet used by Nigerian airlines, improved operations/operational efficiency, improvement and modernization in airport infrastructure, improvement in air traffic management and infrastructure use, fuel conservation techniques, regulatory measures, and other cross-sector initiatives.

This article focuses on detailing with one such initiative—showcasing Nigeria's coordinated efforts to improve fuel efficiency and operational practices—while exemplifying how targeted interventions can deliver tangible environmental benefits and align with ICAO's Long-Term Aspirational Goal (LTAG) of net-zero emissions by 2050.

The implementation of the Performance Based Navigation (PBN) has continued to reduce flight times, fuel burn and CO_2 emissions and improve the air navigation and air traffic management within the Nigerian airspace.

The Nigerian Airspace Management Agency (NAMA) has continued to carry out Free Route usage with commendable results, some of which are highlighted as follows:

Highlights of regulatory measures put in place in Air Navigation Services are:

- Establishment of PBN procedures for flight operation across Kano FIR.
- Establishment of Free Route Airspace in the Kano FIR.
- Total Radar Coverage of Nigeria (Kano FIR and adjacent Airspace).
- Total VHF Radio Coverage to enhance Pilot-ATC communication in Kano FIR and adjacent FIRs.
- AIS Automation to enhance seamless flight operation.
- Deployment of New Navigational and Landing aids at Airports e.g. DVOR & ILS.
- Provision of voice and data links systems to enhance seamless flight operation e.g. CPDLC, ADS-B and ADS-C.

CO_2 emissions mitigation through Air Navigation Services (ANS) are:

- Through Direct routing/FRA.
- Establishment of SID and STARs procedures at Airports.
- Area Navigation (RNAV) flight procedures.
- Air Traffic Flow Management (ATFM).

- Enhanced Navigational and Landing Aids for precision operation at airports.
- Tremendous milestone transformation of ANS/ATC to enhance flight safety, expeditious and seamless flight operation.

Free Route Airspace (FRA) Usage and conventional fixed ATS route usage comparison analysis – First Quarter 2023 (Critical Aircraft – B737)

The conceptualization, development, charting, publication and successful implementation of Free Route Airspace – Local (FRA – Local) in Kano Flight Information Region (FIR) which commenced on the 2nd December 2021 was conducted as follows:

1. INITIAL IMPLEMENTATION: AS09/2021 effective date 2nd December 2021
2. FIRST PHASE INCREMENT: AS10/2022 effective date 19th May 2022
3. SECOND PHASE INCREMENT: AS16/2022 effective date 3rd November 2022
   Ref: ENR 4 (4.1 – 4.4) of the Nigeria AIP

Subsequent appraisals of FRA implementation show general operational benefits as follows;

a. Reduction in flight time
b. Reduction in fuel consumption
c. Reduction in carbon dioxide emission
d. Reduction in ATC / Pilot workload
e. Economic and flight efficiency advantages it portends for airspace users between the Kano FIR and Accra FIR.

Within the Kano FIR, specific FRA – Local implementation benefits as observed include the following;

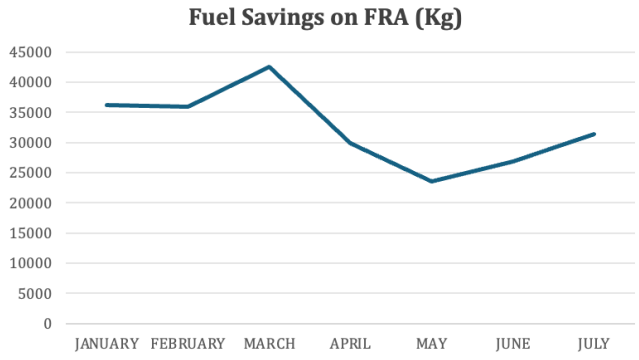
- **Savings in distance** from these improvements could be as much as 39 NM per route leg (route segment) per user, multiplied by number of users per day.
- **Time savings per Route Leg** (Minutes) could be as much as six minutes (6 minutes) per user, multiplied by number of users per day, while
- **Fuel Savings per Route Leg** could be as much as 289.21 Kg per user, multiplied by number of users per day.
- **CO_2 Savings per Route Leg** could be as much as 942.35 Kg per user, multiplied by number of users per day.

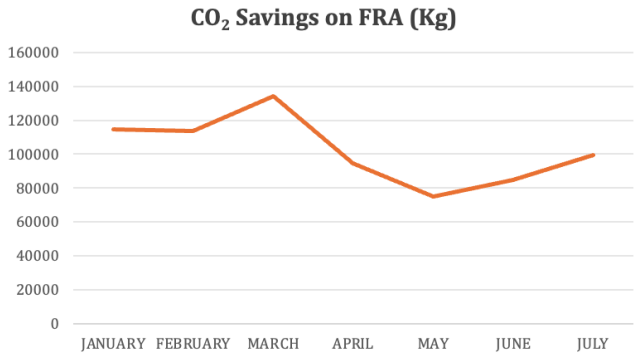
Find on the table in Appendix A, the statistical data for the 1st quarter 2023 (January – March 2023) on the actual **Fuel Savings per Route Leg (Kg)**, and **CO_2 Savings per Route Leg (Kg)** for the international airlines currently operating in the FRA – Local Kano FIR.

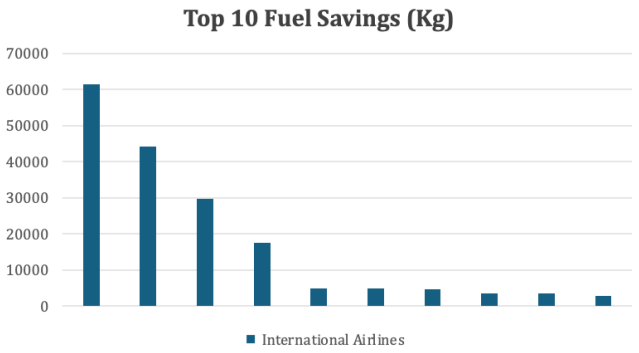
Appendix A

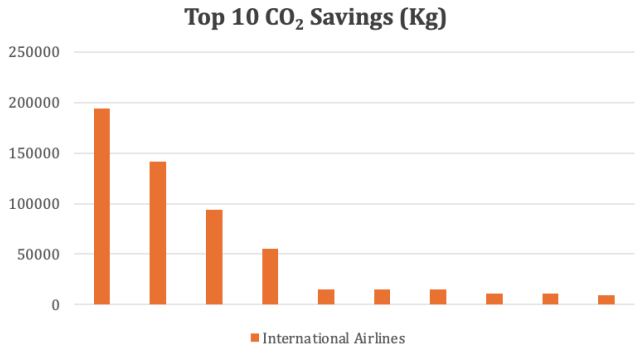
JANUARY 2023		**FEBRUARY 2023**		**MARCH 2023**	
AVIATION FUEL SAVED (KG)	CO_2 EMISSION SAVED (KG)	AVIATION FUEL SAVED (KG)	CO_2 EMISSION SAVED (KG)	AVIATION FUEL SAVED (KG)	CO_2 EMISSION SAVED (KG)
36200.54	**114731.56**	**35901.854**	**113787.206**	**42536.848**	**134415.736**
AVIATION FUEL SAVED (3 Months)		**114,639.242 Kg**			
CO_2 EMISSION SAVED (3 Months)		**362,934.502 Kg**			
AVERAGE MONTHLY AVIATION FUEL SAVED		**114,639.242 kg = 38,213.081 Kg (Prorated) 3 months**			
AVERAGE MONTHLY CO_2 EMISSION SAVED		**362,934.502 kg = 120,978.167 Kg (Prorated) 3 months**			

GRAPHICAL REPRESENTATION OF AIRCRAFT FUEL SAVINGS AND CARBON SAVINGS ON FREE ROUTE AIRSPACE (FRA)









These monthly data can be used as prorated from DECEMBER 2021 – APRIL 2024 (29 months) for FREE ROUTE AIRSPACE (FRA) USAGE / CONVENTIONAL FIXED ATS ROUTE USAGE

***KEY: Shorter distance travelled (FRA) = Reduced travel time = Amount of aviation fuel saved = CO_2 emission saved from entering the atmosphere**

From analysis of the statistical data on the table (Appendix A), the international airlines have saved the following since the implementation of FRA – Local in Kano FIR – **DECEMBER 2021 – APRIL 2024 (29 months);**

1. 38,213.081 × 29 = 1,108,179.349 Kg = 1,108.2 Tonnes

Over 1.1 tonnes of aviation fuel have been saved by international airlines usage of Free Route Airspace in Kano FIR

Consequently, from analysis of the statistical data on the table (Appendix A),

2. 120,978.167 x 29 = 3,508,366.843 Kg = 3,508.4 Tonnes

Over 3.5 tonnes of CO_2 emissions have been saved from being released into the atmosphere by usage of Free Route Airspace in Kano FIR

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