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Sustainable supply of aviation fuel in Nigeria: the status quo and the challenges

Aderibigbe Israel Adekitan
Department of Electrical Engineering and Information Technology, Technische Universität Ilmenau, Ilmenau, Germany

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ABSTRACT

Adequate fuel supply and availability are vital for economic sustainability. Aviation fuel accounts for more than 30% of an airline's operating expenditure. Jet fuel price is one of the factors that determine airfare and airlines' profitability. Nigerian airlines run on civil grade jet A-1 fuel, and almost annually, the aviation sector is plagued with jet fuel scarcity and the resulting flight delays, rescheduling, and cancellations. Jet fuel scarcity and the escalating cost are products of multifaceted factors that are related to finance, logistics, management, and policy. This study highlighted the operational specifics of the Nigerian aviation fuel sector; it identified various business opportunities that affect air transportation and discusses the main industry challenges responsible for jet fuel price volatility and scarcity in Nigeria. Instability and shortage of foreign exchange (Forex), non-refining of jet fuel locally, and absolute dependence on jet fuel importation are some of the key causal factors. A total revamp of the aviation infrastructure, a review of the current incident of multiple and exorbitant operating fees, and licensing of private and modular refineries for jet fuel production will help address jet fuel scarcity issues in Nigeria.

Corresponding Author:

Aderibigbe Israel Adekitan
Department of Electrical Engineering and Information Technology, Technische Universität Ilmenau
Ehrenbergstraße 29, 98693 Ilmenau, Germany
Email: ade_kitan@yahoo.com

1. INTRODUCTION

Air transportation with its associated complex networks is a major source of transportation for people, goods, and services globally. Nigeria is the most populous country in Africa. The Nigerian aviation industry has grown over the years in size, capital investment [1], safety and quality management systems [2], [3], which provided several benefits to the Nigerian economy. The air transport sector contributes about 59 billion Naira to the national gross domestic product (GDP), it supports about 159,000 jobs and pays about 8.5 billion Naira in tax annually. It aids the fast and reliable movement of high-value to weight products, i.e., cargo for shippers. Air transportation stimulates and supports tourism, and it has created opportunities for several international businesses, creating market links for export purposes. Also, it promotes easy skill and technology transference via labour movement across states and countries [4]. Air transportation contributes 10.6% of the global greenhouse gas production, and efforts must be put in place by operators to mitigate this [5], [6]. Figure 1 shows the estimate analysis by Oxford Economics [4] based on the work of the United Nations World Tourism Organization [7], and it can be seen from the chart that most foreigners travel to Nigeria via air transportation.

Nigeria has an estimated population of 193,392,517 [8], which creates a steady supply of passengers for the airlines. Total aircraft movement was 225,942 in 2016 and 88,572 as of Q2 2017. Total passengers for

domestic and international flights were 7,273,982 as of Q2 2016, 14,442,986 for 2016, and 5,538,794 as of Q2 2017. There was a significant reduction in passenger movement in Q1 2017 compared with Q1 2016, which is majorly due to the Nnamdi Azikwe international airport closing in Abuja for maintenance in Q1 2017. In terms of air transport cargo movement, a total of 6,806,559 kg was moved for the year 2016, and 14,779,558 kg as of Q2 2017 [9].

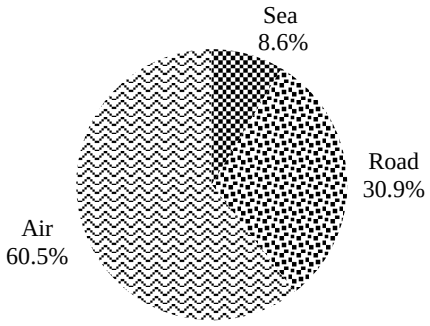

Figure 1. Mode of transportation of foreigners into Nigeria

The aviation sector annually contributes to the national GDP. In 2016, the contribution of aviation to the GDP, i.e. the real or constant growth rate, changed by -4.86% compared to the 2015 figure, which represented ₦94.5 billion and ₦60.05 billion using the constant (2010 baseline) and current basic prices. 2017 experienced an increase of 1.83%, which translates to ₦61,155 billion and ₦105.862 billion using the constant and current basic prices. This trend shows a positive outlook as the economy gradually recovers from the recession in 2016 [10]. Figure 2 shows the variation trend in the aviation sector's contribution to the GDP.

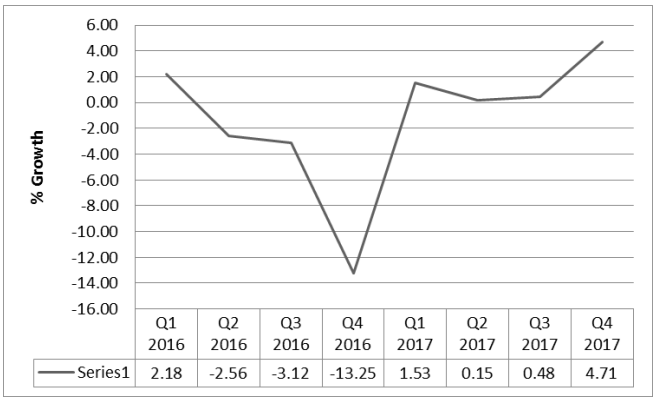

Figure 2. Air transport GDP trend from Q1 2016 to Q4 2017

Aircraft in Nigeria runs on civil grade aviation turbine kerosene (ATK), particularly jet A-1 fuel [11]. Jet fuel is a middle distillate, and it belongs to the kerosene family. The three refineries in Nigeria currently do not produce jet fuel, and as such national jet fuel consumption is sourced via importation from foreign refineries. In 2017, Nigeria imported 340.33 million litres of household kerosene (HHK) and 592.73 million litres of aviation turbine kerosene, while 554.61 million litres of ATK was distributed nationwide via fuel trucks [12]. Between 1986 and 2012, Nigeria consumed an average of 1,253,155 L of jet fuel per day, as shown in Figure 3.

There is a significant dependence on fossil fuels in most countries as a source of energy and national income. The supply and availability of fuels may sometimes be periodically inadequate. The scarcity of fuel in Nigeria negatively impacts sustainable economic development due to its crippling effect on energy-dependent productive activities in the country. Jet fuel scarcity and consequential flight disruptions and cancellations are sometimes a yearly occurrence in Nigeria [13]. These issues are usually due to importation

challenges, licensing difficulties, and foreign exchange scarcity [14]. From 2004 to 2008, the price of jet fuel per litre almost tripled in America. In Nigeria, soaring fuel prices and scarcity reached a peak from 2015-2017 when the country fell into recession because of the global drop in crude oil price, and the value of the Naira, as a result, fell significantly against the dollar [15]. Nigeria earns over 90% of its foreign exchange from oil and gas export, making the economy susceptible to crude oil price variations on the global scene.

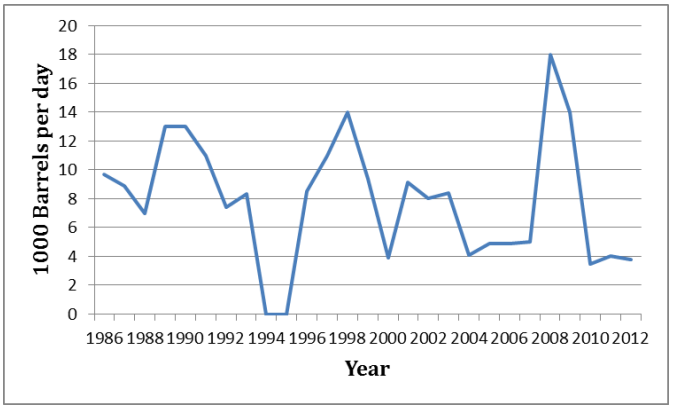

Figure 3. Nigeria's jet fuel consumption [16]

Limited infrastructural development impedes smooth and efficient transportation of liquid fuels in Nigeria [17], and coupled with the poor capacity utilisation of refineries, the supply of liquid fuels inadvertently becomes unreliable. This situation creates energy insecurity and the potential for kerosene adulteration [18]. The focus of this study is to highlight the peculiarities of the aviation fuel business in Nigeria, the giant of Africa, by identifying the business opportunities, the operational challenges facing the sector and their implications.

2. BUSINESS OPPORTUNITIES IN NIGERIA THAT AFFECTS AIR TRANSPORTATION

Several investment opportunities in Nigeria, e.g. the telecommunication sector [19], [20] and the oil and gas sector, motivated many potential investors to travel to Nigeria for feasibility studies. Many such visits led to a fruitful business establishment. These businesses attracted expatriates to relocate to Nigeria to ply their trade [21]. This trend has increased air travel and promotes economic development.

Nigeria is a lower-middle-income economy [1], [22] with verse unexplored natural and intellectual resources. The teeming population provides a vast market and labour force to support industrial growth, and the good weather and fertile soil of the region also support large scale farming. Farming and exportation of agricultural products were the mainstays of Nigeria before and after independence in 1960 before crude oil exploration took over after the first discovery at Oloibiri. The government is currently making an effort via policies, loans, and public sensitisation to promote farming across the nation. Agriculture, as of 2017, contributed 25.08% to the GDP, which indicates that it is a crucial component of the economy, and further growth in the sector will boost the overall GDP. Nigeria is rich in many natural resources apart from oil and gas such as bitumen, coal, oil sand, limestone, gold, lead, zinc marble, granite, iron ore, gemstone, and uranium. Most of these resources are poorly or completely unexplored, with foreign earnings focused on the oil and gas sector. The exploration of these resources has the potential to drive massive increases in air transportation.

Spiritual tourism in Nigeria is increasing; several Christian ministries conduct miracle and healing services worldwide [23]. This kind of tourism has attracted many foreigners who seek a spiritual solution to their challenges to come down to Nigeria [24], [25]. Several thousands of such trips to Nigeria are recorded annually. Also, various tourist centres and destinations exist across Nigeria, e.g. Yankari national park, Ibeno beach, Tinapa free zone and resort, Osun-Osogbo grove, the Ancient Nok settlement, and amusement parks [26]. Private and government investment in tourism, coupled with the adequate promotion of the same, can help in increasing tourism-based air travels to Nigeria. An increase in air travel will simultaneously demand more jet fuel supply to support the increasing traffic. To ensure success, adequate effort must be put in place to address the existing operational challenges to the smooth and regular supply of jet fuel in Nigeria.

3. RESEARCH METHOD

Availability and access to quality data is sometimes a challenge when conducting industry related studies in Nigeria. dataset needed for knowledge discovery may not exist or be centrally collected, and access to such data may be denied if available. Reliable aviation-related statistical data sourced from the Nigerian National Bureau of Statistics were analysed and discussed to provide a background into the study and give a perspective on the size and the impact of the aviation industry in Nigeria. In this qualitative study, the information presented and analysed is based on empirical materials sourced as industry practitioner views from various aviation conferences and workshops within and outside Nigeria. In particular, the Joint Inspection Group (JIG) managers workshop focussed on multiple industry challenges and current changes in relevant aviation fuel quality-control standards and operational guidelines. Likewise, the Stakeholders' Conference on Jet Fuel Supply in Nigeria provided a holistic view of industry challenges. The experts at the conference offered vital industry information and statistics on the challenges and way forward. Also, top issues and potential solutions identified and proposed over time to government aviation parastatals by industry stakeholders are presented and discussed extensively. The study includes information from operational knowledge acquisition via visits to airfields and intermediate shore jet fuel depots in Nigeria.

4. RESULTS OF THE FINDINGS ON THE CHALLENGES FACING THE AVIATION FUEL BUSINESS IN NIGERIA

Nigerian airports are labour intensive rather than capital intensive. To maximise efficiency in all the aspects of the operation, adequate attention to airport management is of utmost importance. The Federal Airports Authority of Nigeria (FAAN) needs to develop policies that consider the heterogeneous nature of Nigerian airports. The following are critical operational and economic challenges that militate against the smooth supply and ready availability of jet fuel in Nigeria, creating a disparity between jet fuel demand and supply. These factors stimulate an excessive increase in jet fuel price, making business difficult for commercial airlines [14]. Few of such airlines became insolvent as a result of high operational and maintenance costs.

4.1. No local refining of jet fuel

100% of the jet fuel consumption in Nigeria is imported; this creates pressure on the jet fuel supply chain. Jet fuel supply companies, both indigenous and multinational, are privately owned with no state vested investment. Jet fuel is imported by these companies or by intermediate shore depots (ISD) owners based on their business projections and financial resources. Hence, importation may not be sufficient to meet the national needs. Also, the importation timeline is not very well structured, and this arrangement can easily result in supply disruptions.

The supply structure also gives room for product hoarding to create artificial scarcity to drive price up. As a result of the import-based supply, poor planning, financial challenges, and various internal organisational issues, jet fuel supply can easily be affected. The Nigerian refineries are barely functional even for refining other petroleum products (diesel and PMS); the dwindling production capacity of the refineries is depicted in Figure 4.

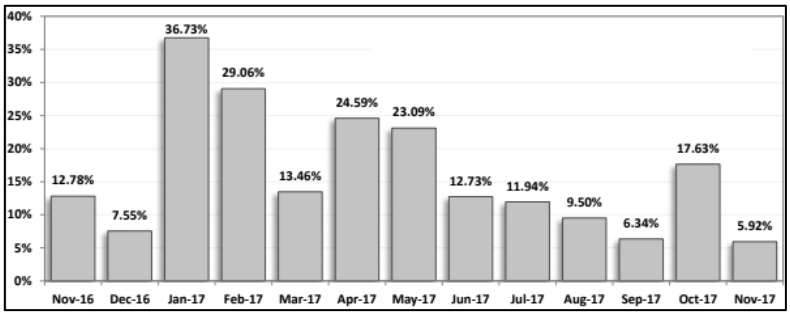

Figure 4. Nigerian refineries capacity utilisation (Source: NNPC monthly operations report)

4.2. Challenging importation logistics

The process of obtaining jet fuel import licences and other financial and fiduciary documents takes time. Setting up a contractual arrangement with foreign refineries also takes time and resources, as this may

require travelling to the location of the refineries for discussions and to finalise the deal. Hence to ensure bulk importation and reduce the number of ship trips, large capacity fuel cargo ships are used for importation, but this creates a challenge at the Nigerian end due to shallow waterways. In Lagos, for example, jet fuel is offloaded at the Apapa jetty area, where many ISDs are based. The inward waterways towards the jetty terminals are shallow, with a draft of about 7-10 m. The implication of this is that big and heavy ships cannot approach such a narrow channel. Hence, it becomes mandatory for the big ships to berth deep at sea, and then lighter vessels are then used to offload the bigger vessels and transport the fuel to the ISD. This increases operational logistics and ship turn-around time. Adequate supply chain management is necessary for the timely and cost-effective distribution of products towards ensuring product availability at a reasonable price.

4.3. The high cost of importation

The substantial import logistics demand and the cost of funds on loans for import purposes and insurance cover result in high importation costs. This deters small jet fuel supply companies from importing it directly; instead, they make arrangements to buy from bulk importers who add their profit to the landing cost. This ultimately increases the buying cost for small companies.

4.4. Fuel haulage via road and poor road networks

Jet fuel is transported from the ISD to the airfield depots via fuel tanker trucks called bridger receipt vehicle (BRV). These bulk road vehicles are in various sizes, such as 33,000 L, 36,000 L, and 42,000 L. The BRVs load at the ISD and transport the product to the airport depots in Lagos or other states. This long-distance road transportation has some associated disadvantages. It creates an increased risk of a road accident [27]. It is slow and delays jet fuel supply; also, it increases operational costs. Several incidents of BRV breakdown en route to airfield depots have been recorded, which creates issues, especially when it occurs on isolated inter-state roads where auto mechanics may not be available. Also, incidents of jet fuel theft and losses may occur. The road networks in some parts of Nigeria are poor, with many potholes and unpaved roads, increasing the risk of accidents.

4.5. Traffic congestion at Apapa Shore Depot

Fuel loading operations take place majorly in the Apapa area in Lagos. Jet fuel, premium motor spirit, and diesel, are mostly loaded from the ISDs around Apapa. This creates an extensively long queue of tanker trucks along the road, disrupting the easy flow of commuter vehicles and creating delays in fuel loading operation. In the early 90s, jet fuel supply to the Lagos Airport used to be via the Mosimi pipeline from Atlas Cove, but this has been abandoned for several years.

4.6. Poor infrastructure

The level of infrastructural development to support the aviation fuel business is insufficient. For example, there is no dedicated plane refueller (bowser) parking space in some airports, and lack of direct apron access route for bowser. Generally, transportation infrastructure in Nigeria needs a complete overhaul and expansion [1], [28], [29].

4.7. High fuel tax and multiple operational fees

Air travel is often perceived as an elite mode of transportation, attracting many interests and operational fees. In Nigeria, the jet fuel surcharge is ₦2.50 per litre, and according to the international air transport association (IATA), this is one of the highest rates in the world [30]. The apron licence charge and ground rent are also high, coupled with other multi-agency fees. These fees increase operational costs, which translates to an increased jet fuel price and a reduced profitability margin for the business risk-takers. This is demotivating and may discourage private investment in the sector.

4.8. Foreign airlines avoid fuelling in Nigeria

During the recession, the high cost of jet fuel in Nigeria discouraged some international airlines from refuelling in Nigeria. Some airlines structure their flight to enable them to fuel in neighbouring countries, e.g., Ghana and Lome, before or after flying to Nigeria. This is a substantial fuelling business loss for the Nigerian aviation fuel sector. An increase in fuel price induces an increase in airfares, as reflected in Figure 5, and this volatility makes it difficult for airlines to plan appropriately. The Wall Street Journal article by Morath [31] shows that airline fares vary with the price of jet fuel and other operational factors.

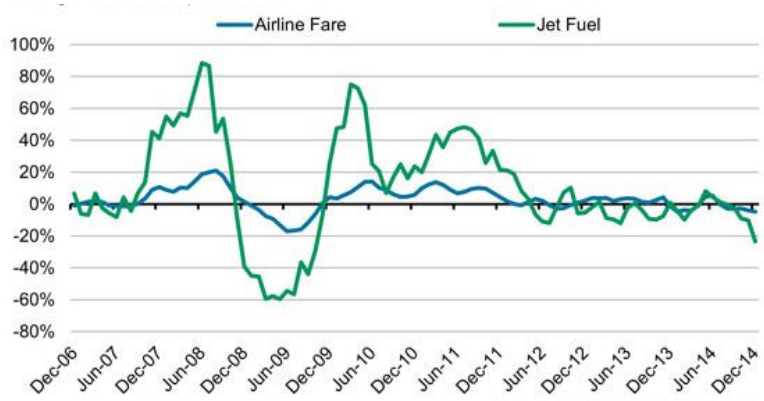

Figure 5. Variation in airline fare and the price of jet fuel (Source: US Labour Department)

4.9. Difficulty in accessing Forex

At the height of the recession in 2017, the government official dollar rate was ₦197 to one US dollars (USD), while in the parallel market, it was ₦365. The government-backed Forex was in short supply, and most companies had to buy dollars at the parallel market. As of June 2021, the official rate is now ₦409 and ₦495 in the parallel market. Unfortunately, USD is purchased at the parallel market rate for indigenous aviation fuel companies, which is high. Still, international airlines want to pay for jet fuel at the official government rate, which is automatically a considerable loss, making fuelling international airlines difficult. Fuel price is determined on the international scene using (1).

$$Jet\ Fuel\ Price = Platts\ quotes + Tax + Premium \quad (1)$$

S&P Global Platts is a generally accepted independent provider of benchmark prices for energy and commodities. On the local scene, pricing is determined as (2).

$$Jet\ Fuel\ Price = Landing\ Cost + Fuel\ surcharge + Operational\ Cost\ (per\ litre) + Profit \quad (2)$$

4.10. The high cost of imported spares and equipment

Most aviation fuel equipment and spares such as filter water separators, micro filters, filter elements, gauges, differential pressure gauge (DPG), under-wing and over-wing hoses, and nozzles are all imported. With the Forex challenges, the cost of these materials soared and this increased operational cost.

4.11. Airlines closing operations in Nigeria

The problematic business terrain in the Nigerian aviation sector and the inability of some foreign airlines to repatriate earnings forced some of them to close down operations. Iberia and United Airlines cancelled their Nigerian operations while some indigenous airlines were placed on receivership due to insolvency issues. The economic regulation of an airport determines its market power and viability.

4.12. Multinational versus indigenous company operational scenario

Multinational aviation fuel companies with foreign affiliations can easily source Forex, import jet fuel in bulk, and procure needed spares. This gave such companies a significant operating advantage that the indigenous companies could not benefit from, creating a dichotomy of business operations.

4.13. High inflation rate

Inflation is a major economic challenge in Nigeria. The average inflation rate for 2011-2015 is 9.7326%. This rate is an indication of price volatility which makes planning and budgeting difficult.

4.14. Jet fuel price volatility on the global scene

Apart from the effects of the peculiarities of the Nigerian business environment, jet fuel price variation also occurs globally, which further affects the already precarious aviation fuel business situation in Nigeria. As shown in Figure 6, significant fluctuations in jet fuel prices occurred at US Gulf Coast between 1991 to 2018.

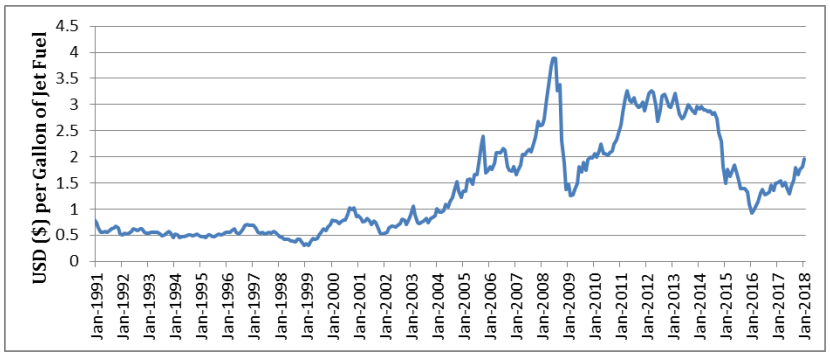

Figure 6. Jet fuel spot price (FOB) [32]

4.15. Poor data management system

The availability of centralised data for trend analysis is sometimes a challenge in Nigeria. Proper data collection and proper management is not a common culture in some establishments. Data is vital to fuel consumption planning, fuel importation analysis and budgeting. Easy availability of detailed data such as the total airlines' fuel consumption and uplift is hard to find. This data should be available for central planning purposes.

5. RECOMMENDATION

The following recommendations are proposed towards alleviating the challenges and issues identified as causal factors impeding the sustainable supply of jet A-1 fuel. i) Encourage local production of jet fuel by issuing refinery operating licences to ready investors. Such an operating licence should be condition-based and activation-time bound to prevent the issue of people collecting permits without implementation. The already existing three refineries in the country should undergo capacity upgrade maintenance, and jet fuel should be included in the output product mix to complement importation. The ongoing Dangote refinery project will contribute immensely to local jet fuel production when completed; ii) Jet fuel haulage using BRV is not optimal, the Mosimi pipeline should be refurbished or a new one constructed for facilitating the direct supply of jet fuel from the ISD to the airport. This will eliminate the Apapa traffic, ensure fast delivery of jet fuel and reduce transportation costs. Rail tankers can be considered as an alternative; iii) The issue of exorbitant and multiple fees should be addressed via an industry-wide stakeholder's discussion session; iv) Difficulty in the renewal of various operating licences should be addressed, and the annual lifespan of some permits needs to be reviewed upwards; v) The government needs to be more actively involved in planning jet fuel supply, both in the sourcing and distribution, to prevent sabotage and ensure a proactive and prompt response to potential supply challenges before it results in scarcity and the attendant implications; vi) Lagos is one of the thirty-six states in Nigeria, and Lagos jetties currently supply a major percentage of the jet fuel used in the country, which is not the best option, transportation and cost-wise. Alternative docks should be created in other regions of the country to decongest the pressure on Lagos and keep sources of jet fuel supply close to the point of need; vii) The official interbank dollar rate currently varies around N409, while the market rate hovers around N500. This is very high as compared to the N197 value in early 2015. The Federal Government needs to make an effort to improve the value of the Naira, and an alternative to payment via Forex can be considered, e.g., the use of crude oil exchange (oil swap deal) for refined petroleum products like jet fuel. If well managed with conditions to prevent abuse and fraud, this initiative will help in conserving Forex; viii) Generally, airport infrastructure and adjoining road networks need to be developed to support increasing passengers and cargo. Facilities to aid jet fuel into-plane operations should be implemented and existing ones upgraded; ix) The high cost of aircraft maintenance abroad can be avoided by setting up a Maintenance, repair and overhaul (MRO) facility in Nigeria. The approval of the C-check maintenance of Boeing classics by the Nigerian civil aviation authority (NCAA) is a welcome development; x) Jet fuel price volatility can be managed by airlines through jet fuel hedging to limit their exposure to rising jet fuel prices in the future; xi) Multi-element key performance indicators (KPIs) need to be developed to track and measure the Nigerian airport and aviation fuel sector performance using key industry parameters; xii) Mandatorily all into-plane companies must subscribe to the aircraft refuelling indemnity (Tarbox) agreements with insurers for managing aircraft refuelling liability risks.

6. CONCLUSION

Air transportation is critical to businesses and other economic activities in Nigeria. It is a source of revenue for the country, generating earnings from both passengers and cargo movements. It also creates various related servicing companies and thousands of jobs for the citizenry. Jet fuel unavailability, inadequate supply, and price volatility are significant sources of disruption to flight schedules and steady airline income. This study discussed the general operational status of the aviation fuel supply industry in Nigeria and identified the major threats to smooth business flow. Zero local jet fuel refining capacity, Forex unavailability and instability are the major causes of jet fuel supply-demand imbalance. As the economy has gradually recovered from the 2015 recession and hopefully would not slide back into recession as an aftermath of COVID-19, the government needs to deploy adequate interventions and policies to arrest the negative trend and create stability in the aviation sector. This will guarantee profitability, motivate private-sector investment, and eliminate the sufferings passengers endure yearly due to flight delays, rescheduling and cancellations induced by the high cost and scarcity of jet fuel.

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BIOGRAPHIES OF AUTHORS

Aderibigbe Israel Adekitan is a Doctoral student and Group for Lightning and Surge Protection in Technische Universität Ilmenau. Skills and Expertise: Induction Motor, Lightning Protection, Safety Management, Risk Assessment, Root Cause Analysis, Aviation Safety, MATLAB Simulation, Electrical and Electronics Engineering, Statistical Data Analysis. He can be contacted at email: ade_kitan@yahoo.com.