



Enhancing Smooth Traffic Flow In Cargo Airports Through Effective Circulation In South East Nigeria

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ABSTRACT

The efficient and seamless movement of goods within cargo airports is crucial for the global and international trade. The abstract provides a comprehensive overview of the strategies and technologies aimed at enhancing smooth traffic flow in cargo airports through effective circulation. By optimizing various aspects of circulation, such as ground operations, infrastructure design, and traffic management, cargo airports can significantly improve their operational efficiency and capacity. To achieve efficient circulation, cargo airports employ advanced technologies and innovative approaches. These include the implementation of automated systems for cargo handling, intelligent transportation system, and real-time data analytics. Through the integration of these technologies, cargo airports can streamline the movement of goods, reduce congestion, and minimize processing time. One of the key areas for improvement in enhancing smooth traffic flow is optimizing ground operations. Cargo airports employ state-of-the-art equipment, such as automated sorting systems and robotic loaders, to expedite the handling and movement of cargo. These technologies enable faster and more accurate processing, reducing bottlenecks and enhancing overall efficiency. Additionally, effective infrastructure design plays a vital role in facilitating smooth traffic flow. Cargo airports are designed to accommodate the specific needs of cargo operations, with dedicated cargo aprons, taxiways, and parking bays. Well-planned infrastructure ensures efficient circulation of aircraft, ground vehicles, and cargo, thereby minimizing delays and optimizing throughput. Traffic management systems also contribute significantly to enhancing circulation within cargo airports. These systems utilize real-time data from various sources, including air traffic control, ground handling operations, and vehicle tracking, to dynamically manage and allocate resources. By employing predictive analytics and optimization algorithms, traffic management systems can proactively identify congestion points and reroute traffic, ensuring a continuous and efficient flow of cargo within the airport premises. Furthermore, effective collaboration and coordination among all stakeholders involved in cargo operations are essential. This includes airlines, ground handling agencies, customs authorities, and other relevant entities. By establishing streamlined communication channels and adopting standardized procedures, cargo airport can enhance coordination, minimize processing delays, and improve overall traffic flow. In conclusion, enhancing smooth traffic flow in cargo airports through effective circulation requires a multifaceted approach. It involves the integration of advanced technologies, optimization of ground operations, effective infrastructure design, and robust traffic management systems. By implementing these strategies, cargo airports can achieve higher operational efficiency, reduce costs, and better serve the global supply chain, ultimately fostering economic growth facilitating international trade.

Keywords: Effective infrastructure design, Traffic management, Effective coordination collaboration,

INTRODUCTION

A sojourner who had been used to how things work and how easy life is relatively in his second home, will surely feel disappointed, or even disgusted about the way things run in this country. I am certainty

not that sojourner, but if you've been around some, you will still know something is wrong with the way we handle things here. My worries actually started on disembarking at the Gnassingbe Eyadema International on transit to Nigeria on the jet way/loading bridge, I noticed a mammoth crowd almost way back into the entrance of Airport the plane and I wondered what went down. I soon learned officials. I was on the forever stagnant lane populated by Nigerians, the middle lane was for privileged people who were actually brought from the rear to an unhindered passage, and the third line consisted mainly of Ghanaians and other nationals. It was also faster than ours. Nigerians clearly stood out of my lane. And of course, we all were discussing why the segregation. Again, we noticed something strange on the wall of the jet-way, depicting all countries in Africa or at most, countries surrounding Togo. Nigeria was conspicuously absent. We all wondered. Yours sincerely and others said it aloud that the treatment was unfair. A fellow Nigerian on the queue said, turning to me, "we are no longer the giant of Africa". I disagreed and said, "Definitely not in completion with Togo". I think Togo's action should be investigated by Nigerian Embassy there or our Ministry of Foreign Affairs. We ended up checked about three times at other posts within the we had to queue up for another round of checks before entering in to Togo. Seriously, I did not have anything against the scrutiny. That is what every country should do. You can tell, someone may want to stowaway in Togo. After all, it is abroad too. The story is that, in that narrow cocoon of jet-way, there were three lanes, as arranged by the airport airport. Getting back home at the Murtala Mohammed Airport, I noticed another bottleneck. You had few counters checking your passport and eventually sending you to Immigration. Both of these involved very long queues and then the customs people requesting that you open bags for a search. These bottle necks should be minimized, at least, to give a good impression to a first time visitor to Arica. Some of these routines can be digitalized. If aviation was a country, it would be the world's 20th largest GDP. (James Asquith, 2020)

The aviation industry is the business sector dedicated to manufacturing and operating all types of aircraft. Air traffic controllers when they are awake, are concerned with Aviation safety. The Nigerian aviation industry or air transportation provides Infrastructure which is fundamental to the development of the country. Efficient air transportation is a means transportation that conveys people and Cargo from one place to another safely on time without delay or flight Cancellation or any other problem. It also contributes to economic growth and development. However, in Nigeria, it suffers from poor reputation for Operational efficiency and safety (Wikipedia, 2011). The historical development of air transportation in Nigeria. Air travel in Nigeria commenced during World War II (1939 – 1945) when it became necessary to move troops and supplies fast across the country. Several air strips were built then which were converted after the war to civilian use (ILeoje, 2003). Nigeria was established in October, 1958 as a joint venture between the Nigeria government, Elder Dempster lines and British overseas Airways Corporation (BOAC). The airways took over the operation of domestic flights from the disbanded West Africa Airways Corporation (WAAC) which had been operating commercial aircraft within the country since 1946 (Filani,1983).

In 1963, the Nigeria federal government bought out other shareholders and Nigeria Airways became wholly owned by Nigeria government. The airline has a monopoly for providing domestic air services in Nigeria. It was also the national flag carrier for international services along the West Africa coast, Europe and United States of America. If aviation was a country, it would be the world's 20th largest GDP James Asquith,(2020). Air transportation is the transportation of passengers and cargo by aircraft and helicopters. It is a transport system that involves the movement or carriage by air of persons or goods using airplanes and helicopters (WIE, 2011).

The historical development of air transportation in Nigeria gives rise to the growth of Nigeria aviation industry which, today looks so verse that it is categorized to as a whole commercial, general and military aviation. This research work focusses on passenger and cargo, using circulation to enhance smooth cargo traffic flow in South East Airports of Nigeria. Effective traffic is crucial for the smooth operations of cargo airports. These airports serve as critical hubs for the movements of goods and play a vital role in supporting global trade and commerce. However, the increasing volume of air cargo, coupled with growing demands for expedited delivery and logistics optimization, has posed significant challenges in maintaining smooth traffic flow within cargo airports. In order to address these challenges, it becomes

imperative to implement effective circulation strategies that streamline the movement of cargo, vehicles, and personnel throughout the airport infrastructure.

Importance of Smooth Traffic Flow in Cargo Airports: (A) **Economic Significance:** Cargo airports are vital components of the global supply chain, facilitating trade and supporting economic growth.

Efficient traffic flow enhances productivity, reduces costs, and improves the competitiveness of cargo operations. (B) **Operational Efficiency:** Smooth traffic flow minimizes congestion, delays and bottlenecks, enabling quicker processing and turnaround times. Enhanced operational efficiency increases throughput capacity and optimizes resource allocation within cargo airports.

Challenges in Traffic Flow Management: (A) **Increasing Air Cargo Volume:** Growing demands for e-commerce and international trade have resulted in a surge in air cargo shipments.

Handling larger volumes of cargo poses challenges in managing traffic flow within limited airport infrastructure. (B) **Diverse Stakeholders:** Cargo airports involve multiple stakeholders, including airlines, ground handlers, customs agencies, and logistics companies.

Coordinating the movement of cargo, vehicles, and personnel across various stakeholders necessitates effective circulation strategies. (C) **Safety and Security:** Ensuring the safety and security of cargo and personnel is paramount in cargo airports. Traffic flow management should incorporate measures to minimize potential risks and vulnerabilities.

Strategies for Enhancing Traffic Flow in Cargo Airports: (A) **Infrastructure Planning and Design:** Optimal layout and design of cargo facilities to minimize bottlenecks and congestion points.

Separation of flows, including vehicle circulation, pedestrian pathways, and cargo handling zones, to ensure smooth movements. (B) **Intelligent Transportation Systems (ITS):** Integration of advanced technologies such as real-time data collection, traffic monitoring, and predictive analytics.

ITS enables proactive traffic management, optimizing resource allocation and mitigating potential disruption. (C) **Collaborative Stakeholder Coordination:** Establishing effective communication channels and coordination mechanisms among stakeholders. Joint planning, information sharing, and synchronized operations can improve overall traffic flow efficiency. (D) **Automation and Robotics:**

Implementation of automated systems and robotics for cargo handling and vehicle movement. Automation reduces human errors, enhances operational speed, and improves traffic flow within cargo airports. (E) **Sustainable Mobility Solution:** Integration of eco-friendly transportation modes, such as electric vehicles and alternative fuels. Sustainable mobility solutions reduce emissions, congestion, and operational costs while enhancing traffic flow efficiency.

RESEARCH METHOD

A case study research approach was employed on some existing cargo and passenger airports at The south east of Nigeria. This research investigates the inadequate policies, modern infrastructure and management operations that hinders smooth circulation and traffic flow in cargo and passenger airports in the south east region of Nigeria. The Nigeria and architectural design solutions and policies to improving the provision of modern infrastructural technology, effective management strategies with efficient collaboration and operations. The disciplinary area of focus is architecture as such, content base analysis was used and looked into previous studies done in the subject matter by different authors.

FINDINGS

Anambra has a cargo and passenger international airport terminal located at Umuleri in Umuleri. Anambra State. It was built in a record time of 15 months by the Willie Obiano-led Anambra State Government. The test flight was performed on April 30, 2021. The first plane that landed at the airport was a plane from the Air Peace fleet owned by Chief Allen Onyema, an indigene of the State. The said Airport is expected to create about 1000 direct and indirect jobs. The Cargo and Passenger airport is a Category (CAT) 4F Airport This means that Airbus A380 can land comfortably the airport. The runway is the second-longest runway in Nigeria with Length—37km and Runway end safety area (RESA) of 1km at both ends of the runway. Width – 60m, Strip- 440m on the either side of the runway and the Thickness is 270mm. (Plate 1).



(Plate 1) Proper noise control within the terminal building using thick plate glazing and aluminum frames. Adequate passenger flow through the separation of departure and arrival passengers within the domestic and international area



(Plate 1B) view of terminal from the apron (airside). Poor weather control as a result of lack of passenger boarding bridge. Long distance walks within the arrival and departure areas, thereby causing tiredness of the passengers and rowdy passage. Inadequate public service facilities like telephones, post office.



(Plate 1C) of Anambra cargo and passenger international airport, from the case study findings, showing the adequate car parking lots facilities.



(Plate 1D) of Anambra Cargo and Passenger international Airport, from case study findings, showing the adequate concourse, ramping facilities and advanced moving staircase technologies at effective strategic places toward enhancing smooth flow and circulation for both cargo and passengers.



(Plate 1E) of Anambra Cargo and Passenger international Airport, from case study findings, showing the adequate concourse, ramping facilities and advanced moving staircase technologies at effective strategic places toward enhancing smooth flow and circulation for both cargo and passengers.



(Plate 1F) of Anambra Cargo and Passenger international Airport, from case study findings, showing adequate sitting arrangements, proper natural and artificial lighting systems for collaborations and effective management practices toward enhancing smooth flow and circulation for both cargo and passengers.



(Plate 1G) of Anambra Cargo and Passenger international Airport, from case study findings, showing adequate sitting arrangements, proper natural and artificial lighting systems for collaborations and effective management practices toward enhancing smooth flow and circulation for both cargo and passengers.



(Plate 1H) of Anambra Cargo and Passenger international Airport, from case study findings, showing adequate sitting arrangements, good interiors office spaces arrangements, proper natural and artificial lighting systems for collaborations and effective management practices toward enhancing smooth flow and circulation for both cargo and passengers.



(Plate 1I) of Anambra Cargo and Passenger international Airport, from case study findings, showing the aerial view of the entire site for collaborations and effective management practices toward enhancing smooth flow and circulation for both cargo and passengers.

Akanu Ibiam International Airport), also known as Enugu Airport, is an airport serving Enugu, the capital city of Enugu State of Nigeria. The airport is named after the late Akanu Ibiam (1906-1995), a Medical Doctor and Statesman who hails from Afikpo in Ebonyi State. The Akanu Ibiam International Airport in Enugu serves well over 600,000 passengers currently every year but this number is expected to change when the airport commences services for international passengers. This Enugu, one of the eastern part of Nigeria airport was renovated to serve as both Cargo and passenger airport, and not only passenger's airport as it was before. See below (Plate 2), showing the front façade and some interior functional spaces.



(plate 2A) showing the front façade and some interior functional space.



(Plate 2B) of Enugu Cargo and Passenger international Airport, from case study findings, showing adequate sitting arrangements, good interiors office spaces arrangements, proper natural and artificial lighting systems for collaborations and effective management practices toward enhancing smooth flow and circulation for both cargo and passengers.

Summary of Key Findings: Infrastructure Planning and Design: The study emphasizes the significance of well-planned and appropriately designed cargo airport infrastructure. Effective circulation necessitates the strategic layout of cargo terminals, runways, taxiways, and aprons, considering factors such as traffic flow, cargo types, and operational requirements. **Traffic Management Systems:** Implementing advanced traffic management systems is crucial for enhancing traffic flow in cargo airports. Intelligent transportation systems, including real-time monitoring, automated cargo tracking, and data analytics, enable better traffic planning, congestion management, and resource allocation. **Collaborative Stakeholder Engagement:** The research highlights the importance of collaborative engagement among cargo airport stakeholders, including airport authorities, airlines, freight forwarders,

and regulatory bodies. Effective communication and coordination foster shared goals, leading to streamlined processes and optimized circulation. **Operational Efficiency and Process Optimization:** Efficiency in cargo handling processes significantly impacts traffic flow. The study suggests adopting streamlined operational procedures, such as optimized cargo handling equipment, automated cargo processing systems, and efficient cargo sorting and storage techniques. These measures minimize congestion and delays, ensuring smoother traffic flow.

Sustainable Infrastructure and Green Initiatives: Promoting sustainability in cargo airport infrastructure and operations is essential. Incorporating eco-friendly practices, such as utilizing renewable energy sources, implementing emission control measures, and promoting green logistics, can enhance traffic flow by minimizing environmental impacts and reducing operational costs.

CONCLUSION

Enhancing smooth traffic flow in cargo airports through effective circulation requires a comprehensive approach that combines infrastructure development, advanced traffic management systems, stakeholder collaboration, process optimization, and sustainable practices. By implementing the recommended strategies, cargo airports can overcome operational challenges, minimize congestion, reduce delays, and ensure efficient movement of goods. This research serves as a valuable resource for cargo airport authorities, policy makers, and industry professionals, guiding them towards achieving seamless traffic flow and contributing to the overall success of global supply chains.

RECOMMENDATIONS

Based on the findings, the following recommendations are proposed to enhance smooth traffic flow in cargo airports through effective circulation:

Infrastructure Development: Invest in comprehensive infrastructure planning and design that considers projected growth, technological advancements, and traffic patterns to accommodate increasing cargo volumes efficiently.

Traffic Management Systems: Leverage advanced technologies, such as automated cargo tracking systems, real-time data analytics, and intelligent traffic management systems, to optimize traffic flow, identify bottlenecks, and facilitate timely decision-making.

Stakeholder Collaboration: Encourage collaborative engagement and information sharing among cargo airport stakeholders to develop integrated processes, enhance communication, and improve overall efficiency.

Process Optimization: Implement streamlined cargo handling procedures, including automated cargo processing systems, optimized storage techniques, and efficient cargo sorting methods, to reduce congestion and minimize delays.

Sustainable Practices: Embrace environmentally friendly initiatives by adopting sustainable infrastructure solutions, implementing energy-efficient technologies, and promoting green logistics practices to reduce environmental impact and enhance operational efficiency.

REFERENCES

James Asquith (2020) if aviation was a country, it will be the world 20th largest by GDP.

<https://www.forbes.com/sites/jamesasquith/2020/04/06/if-aviation-was-a-country-it-would-be-the-worlds-20th-largest-by-gdp/?> accessed on 15 august 2022

Aviation Benefits Beyond: Borders adding value to the economy

<http://aviationbenefits.org/economic-growth/adding-value-to-the-economy/> accessed on 2August 2022

Nigeria Investment promotion Commission (2019) 'Nigeria Bilateral Air Service Agreement Climb to 92, 'NPC, October 22, 2019.

<https://www.nipc.gov.ng/2019/10/22/nigerias-bilateral-air-service-agreements-climb-to-92/> accessed on 18 August2022

George Etomi and Partners (2017) Review of the bilateral air service Agreement within the Nigeria civil Aviation Context.

<https://www.lexology.com/library/detail.aspx?g=4cec6a37-4d6f-4abd-bddi-713502ea0d7c> accessed 5 August 2022.

Rot in Africa airports: my Togo experience/ The Nation News....

<https://thenationonlineng.net/rot-in-africa-airports-my-togo-experience/>

National America University (2021) why aviation industry is important?

<https://www.national.edu/2021/06/23/why-aviation-industry-important/> accessed on 8 August 2022.

Aviation Industry: All you need to know <https://www.revfine.com>aviation...>

Aviation Industry Collocation/Meaning and examples of use <https://dictionary.cambridge.org> Cambridge Dictionary

Aviation Sector Definition <https://www.lawinside.com>aviation>

Covid-19 and the Aviation Industry: Impact and Policy <https://www.oecd.org>coronations>

Aviation Industry and Implication For Economic <https://samphina.com.ng>aviation...>

What is Aviation Management? Definition and Jobs in Aviation <https://sg.indeed.com>finding-a-job>

Aviation Industry analysts-Aircraft trip Operating Cost <https://aviaproconsulting.ca>

The Aviation Industry And Its Workforce <https://www.nap.edu>read>chapter>

Market Leadership in niche Segments of the aviation <https://www.grin.com>document>

The Trends That will Define Aviation In 2023 <https://simpleflying.com>2023aviation>

Estimation of a Model of Entry in the Airline Industry <https://www.jstor.org>stable>

Top 8 Challenges For the Aviation Industry in 2023 and ...Global Market Insights <https://www.gminsights.com>blogs>

Air Cargo operations: Literature review and comparison with practices July 2015

Transportation Research part C Emerging Technologies 56(4) Dot: 10 1016/i.trc.2015.03.028 Authors Bo Feng, Yanzhi Li (The Hong Kong University of Science) and Max Shen (University of California Berkeley).