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Reviewing the Pathway for Indigenous Aerospace Technology Development in Nigeria: From Import to Innovation

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ABSTRACT **Review Article**

Nigeria's aerospace sector remains essentially vital but regrettably dependent, with 100% of commercial aircraft, 90% of spare parts, and 95% of MRO services all sourced abroad up till first half of 2026, costing over $500M in annual forex outflow. Despite having Africa's largest aviation market, a 4°N equatorial launch advantage, and growing drone capabilities, Nigeria, unfortunately still lacks a coherent pathway from technology import to indigenous innovation. This paper reviews Nigeria's aerospace trajectory 1963-2026 and proposes a phased "Import - Imitate - Innovate" pathway to 2045. Using secondary data from NASRDA, NCAA, IATA, NBS 2020-2025, and comparative analysis of Brazil, Turkey, and India, the study applies Technology Readiness Level [TRL] and Porter's Diamond frameworks. Findings reveal that Nigeria has huge market demand, rich human capital potential, and right policy intent, but faces gaps in policy implementation funding, infrastructure, certification, and skills. The paper recommends a 4-phase pathway to wit: **1.** Drone-led industrialization 2026-2030, **2.** MRO + Components 2030-2035, **3.** Licensed Assembly 2035-2040, and **4.** Indigenous Design + Launch 2035-2040. Religious and articulate implementation of these strategies can bring about 3.5% GDP contribution, create about 95,000 jobs, and attract $2.8B forex savings by 2040. Hence the study concludes that industrial policy among others and not necessarily market forces alone, is required to put Nigeria on the pathway from "importer of wings" to "innovator of wings."

Keywords: Indigenous Aerospace, Technology Development, Industrial Policy, MRO, Drones, Space, Innovation Pathway.

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Introduction

Aerospace capability is a strategic asset for national security, economic diversification, and technological sovereignty. Interestingly, these must have motivated some Non- Super-Countries to go headlong into developing their own respective indigenous aerospace industries—Brazil with Embraer, Turkey with TAI, and India with ISRO—did so through deliberate state-led industrial policy over a period of about 20-25 years [Embraer, 2024; TUSAS, 2024; ISRO, 2024].

Nigeria presents a paradoxical and ironical situation as the Africa's largest aviation market with 15.3M passengers and 200+ aircraft in 2023, yet it imports 100% of its aircraft and 90% of the components [FAAN, 2024; IATA, 2023]. The National Space Research and Development Agency [NASRDA] at present has successfully launched 5 satellites since 2003, but all were built abroad [NASRDA]. MRO costs alone exceed $500M annually, with 95% of C-checks performed in UAE, Ethiopia, and South Africa [IATA]. [2025][2023].

Research Question

What ideal pathway can Nigeria follow to successfully transit from aerospace technology import to its own indigenous innovation by 2035?

Objective

To review Nigeria's current state and develop a feasible "Import - Imitate - Innovate" roadmap grounded in comparative evidence while appreciating Nigeria's factor endowments.

Literature Review

Theoretical Frameworks

1. Technology Readiness Levels [TRL] 1-9: NASA's model shows technology must mature from concept [TRL 1] to flight-proven [TRL 9] before commercialization. Meanwhile, most Nigerian aerospace activities at present are at best between TRL 3-6 [NASA].
2. Porter's Diamond of Competitive Advantage: The argument is that factor conditions, demand conditions, related industries, and firm strategy + government determine national competitiveness.
3. Latecomer Catch-up Theory: Obviously all Latecomer economies definitely do enter high-tech sectors through technology transfer, imitative learning, and incremental innovation [Lee & Lim, 2001]. [2020][1990].

Comparative Experiences

1. **Brazil – Embraer Model:**
This was founded in 1969 with state capital. It actually started with licensed turboprop assembly and regional jets and global OEM by 2000.

2. **Turkey – TAI Model:**
This began with F-16 co-production under offset agreements in1984 and indigenous trainer Hürkuş in 2013 and then fighter jet KAAN in 2023 [TUSAS].

3. **India – ISRO Model:**
They took a 20-year focus on satellites + launchers and commercial launch services at a cost of $300M annually by 2023 [ISRO]. [Embraer][2024]

Gap in Literature

There is yet no known study till date that has integrated Nigeria's drone, space, MRO, or manufacturing sectors into one phased innovation pathway.

Methodology

This study adopts a qualitative document analysis and comparative case study design for the review.

Data Sources

1. **Primary Government Data sources include:** NASRDA Annual Reports 2020-2025; NCAA Part-145 MRO List 2023; NBS GDP Reports 2020-2024; NITDA Drone Registry 2025.
2. **Industry Data:** IATA MRO Briefing 2023; FAAN Traffic Statistics 2024.
3. **Comparative Data:** Embraer, TAI, and ISRO annual reports 2020-2024.

Analytical Approach

1. **Baseline Mapping:** Nigeria's aerospace assets and gaps in 2027 using Porter's Diamond.
2. **Scenario Analysis:** Three pathways: Business-as-Usual, Accelerated Growth, Regional Hub.
3. **Phased Road-mapping:** TRL-based sequencing of drones, MRO to assembly to design.

Ethical Consideration

All data are secondary and public domain. No human subjects involved.

Results and Discussion

Nigeria's Current Aerospace Baseline 2027

Market size: 15.3M Passengers: 200+ Aircraft: $1B
West Africa MRO market: Large domestic demand exists.
Space: 5 satellites, 0 launch capability, equatorial location: 4°N. Launch cost advantage unused.
Aviation MRO 1 Part-145 facility, 5% market share, 95% forex leakage.
Manufacturing: 450 drone operators, 3 assemblers <150kgComposites/avionics base exists.
Skills: 120 aerospace engineers annually, no AS9100 suppliers, Certification bottleneck.
Policy: No Aerospace Manufacturing Act, 35% duty on parts, Disincentive to local production.

Porter's Diamond Analysis for Nigeria

1. **Factor Conditions:** Weak. Abundant labor but no wind tunnels, titanium plants, or reliable power.
2. **Demand Conditions:** Strong. Sophisticated airlines and military demand exist.
3. **Related Industries:** Weak. No aerospace fasteners, seals, or avionics ecosystem.
4. **Government Strategy:** Fragmented. No long term coordinated policy plan.

The Proposed Pathway

Import - Imitate and Innovate with a target plan like 2026-2045 plan.

Phase 1: Drone-Led Industrialization 2026-2030 [TRL 6-7].
Goal_: Build composites, avionics, and software base.

Actions_: Scale 450 and 2,000 drone operators; establish Zaria test range; mandate 40% local content in MDAs [NITDA, 2025;

Phase 2: MRO + Non-Structural Components 2030-2035 [TRL 7-8]
Goal: Capture 30% of West Africa MRO.
Actions: Lagos/Kano Aerospace Free Zones; 20% offset law for aircraft imports; produce seats, galleys, fairings [Paper #11].

Phase 3: Licensed Assembly 2035-2040 [TRL 8]
Goal: Assemble 2-seater electric trainer + regional jet components.
Actions: PPP with Embraer/TAI; Tier 2 structural parts; first flight of "Made in Nigeria" trainer [Paper #7].

Phase 4: Indigenous Design + Launch 2040-2045 [TRL 9].
Goal: Regional hub status.
Actions: Akwa Ibom orbital launch site operational; indigenous satellite data services $500M/year; 25 launches/year.

Projected Impact Under Accelerated Growth Scenario

Metric: 2027.
Baseline: 2045 Target.
GDP Contribution: 0.6% to3.5%
Jobs: 12,000.
USD95, 000 direct + USD150, 000 indirect.
Forex Impact: $500M/year+$2.8B/year saved/earned.
Local Content: <5%, 35-40%.

Recommendations

It will be informative and wisdom to operationalize the following pathways and many others that Nigeria needs to implement in order to actualize or get started with the transition from Import to Innovation:

1. Market Creation:
Enforce 20% local content in all aircraft imports >$50M and 40% in public drone procurement by 2030.

Conclusion

Nigeria's aerospace sector may simply be considered to be at an inflection point. Continued import-dependence will eventually lead to marginalization, exploitation, aviation colonization and sustained forex drain under a Business-as-Usual scenario. This is in spite of the fact that, the country undeniably possesses three non-replicable aerospace advantages to wit:

1. Africa's largest aviation market.
2. A 4°N equatorial launch site.
3. An emerging drone ecosystem.

Further assessing the possibilities of "Import to Imitate to Innovate" pathway shows that Nigeria does not need to build a jet engine in immediately. It must start with drones, move to MRO and parts, then assembly, before finally having an indigenous design. Comparative evidence from Brazil, Turkey, and India confirms this systematic and sequencing route.

The decisive period appears to be between 2026-2035 for Nigeria to enact the Aerospace Act, strictly enforces it, funds R&D, builds test infrastructure, and trains about 25,000 people before 2030, so as to achieve the anticipated Regional Hub scenario on or by 2045 considering the fact that Aerospace is a long-term technology preparation. Otherwise, it may remain an aerospace consumer for a much longer period.

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