DEVELOPMENT OF INDIGENOUS MILITARY TECHNOLOGY IN NIGERIA: THE DEFENCE RESEARCH AND DEVELOPMENT BUREAU IN FOCUS

A PAPER PRESENTED

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BACKGROUND

1. Historically, technology has been the key driver of development and national security in nations. The ability to wage war or deter potential adversaries depends to a large extent on a country's level of technological sophistication. Similarly, the success of modern-day military is measured by their ability to domesticate defence production and employ unique indigenous military technologies through Research and Development (R&D). R&D refers to the set of innovative activities undertaken by individuals or groups in developing new services or products. It also applies to improving existing services or products. R&D is the driving force behind innovation and also the key to staying ahead in the ever-evolving military technology.

2. Military technology is the application of technology for use in warfare. The earliest evidence of a specialised indigenous military technology was the stone walls of Jericho in about 8000BC (James, 2023). Since World War 1 (the chemist war), advances in science-based technologies have been viewed as essential elements of a successful military.

3. In the late 1960s, the military through the US Department of Defence Advanced Research Projects Agency (DARPA) spearheaded the research efforts into the first wide area packet switched network called the Advanced Research Projects Agency Network (ARPANE) (Olawumi, 2024). This formed the foundation for the growth of the internet widely used today.

4. In India, the Defence Research and Development Organisation (DRDO) was established in 1958 to develop indigenous strength in defence-related technologies. DRDO formulates and executes military technology related programmes through R&D leading to the development of indigenous cutting-

edge military technology, weapon systems and equipment for the Indian Armed Forces.

5. In Nigeria, the Armed Forces depends heavily on foreign supply of nearly all its defence equipment and technologies to manage emerging security threats. This dependence on importation of military hardware is detrimental to the growth of R&D and the spin off effects as well as the national security.

6. At the peak of the Counter Insurgency Operations (COIN) between 2014 and 2016, Nigeria's efforts to acquire right capabilities were frustrated by some Western countries even when the technologies and platforms were to be acquired elsewhere.

7. Venting the government's position during the graduation ceremony of Course 23 of the National Defence College in August 2015, former President Muhammadu Buhari berated the nations technological base and R&D efforts; stating that 'Our dependence on other countries for critical military equipment is unacceptable, we must evolve viable mechanisms for near self-sufficiency in military equipment and logistics production complemented only by very advanced foreign technologies'.

8. It was in response to this presidential directive as well as the need to tackle the emerging threats with unique indigenous technologies that the then Chief of Defence Staff, General Gabriel Abayomi Olonisakin mooted the idea for the establishment of the Defence Research and Development Bureau (DRDB) in 2017. DRDB was therefore established to initiate, conduct and coordinate robust R&D in defence and security related areas towards attaining near self-reliance in military technology and equipment holding.

9. Seven years after the establishment of DRDB, Research, Development and Innovation which is the fulcrum of military technology is still at its infancy in the AFN compared to the Armed Forces of some emerging market economies. One

of the reasons for this is that the Services conduct R&D in silos without the collaborative efforts of the research institutions, industries and the government.

10. It is perhaps this reason and others to be examined, that could be affecting the low development of indigenous military technology in Nigeria and by extension, non-realization of the vision of self-reliance in indigenous military technology and equipment holding. Therefore, the purpose of this presentation is to examine the challenges hindering DRDB from developing indigenous military technology.

AIM

11. The aim of this presentation is to examine possible ways of enhancing the development of indigenous military technology in Nigeria by DRDB.

SCOPE

12. The lecture will cover the following:

a. Conceptual Definition.

b. Overview of Indigenous Military Technology in Nigeria.

c. Case studies of Development of Indigenous Military Technology in three selected countries.

d. Establishment of Defence Research and Development Bureau.

e. Challenges to Developing Indigenous Military Technology in Nigeria by DRDB.

f. The Way Forward.

CONCEPTUAL DEFINITION

13. The key concepts of this lecture are: Indigenous, Military, Technology and Military Technology. Defining the terms therefore is for a better understanding of the presentation.

INDIGENOUS

14. Indigenous means native to a particular region or environment. It means originating or occurring naturally in a particular place, region or environment (Floai, 2023).

MILITARY

15. Military in the context of this lecture represents the Armed Forces (Army, Navy and Airforce). Therefore, it would be used interchangeably with the Armed Forces and Defence.

TECHNOLOGY

16. Technology is the application of scientific knowledge for practical purposes whether in industry or in our everyday lives.

MILITARY TECHNOLOGY

17. Military technology is the practical use of applied scientific knowledge for defence and security purposes.

INDIGENOUS MILITARY TECHNOLOGY

18. Indigenous Military Technology is therefore defined as that technology which is innovated and developed within one's native place or country for defence and security purposes. It may or may not be conceived or applied in the native place.

OVERVIEW OF INDIGENOUS MILITARY TECHNOLOGY IN NIGERIA

19. The history of indigenous military technology in Nigeria predates Nigerian independence. The art and craft of blacksmithing was practiced across parts of pre-colonial Nigeria and aided local industrialization and production of weapons of warfare (Osuala, 2012).

20. With the attainment of independence in October 1960, the government established the Defence Industry Corporation of Nigeria (DICON) by an Act of Parliament 1964. The purpose of the establishment was for DICON to develop and produce indigenous defence technologies and equipment either singly or in partnership; towards achieving a near self-reliance and self-sufficiency in defence production. Thus, DICON in partnership with a West German Technical partner, Fridz Warner, produced arms and ammunition to support the civil war effort of the Nigerian Armed Forces from 1967 – 1970.

21. Similarly, between 1967 – 1970, the defunct Republic of Biafra made significant efforts in developing indigenous military technology and equipment. Through the ingenuity and innovations of the erstwhile Biafran Armed Forces Research and Production Unit (RAPU) and the academia as well as the industry, several homemade weapons were produced. They include some indigenous bombs (OGBUNIGWE), small arms, ammunition, some armoured tanks using the frames of caterpillar, and a serious attempt to fabricate an aircraft.

22. The Republic of Biafra's technical exploits that integrated military R&D, academia and the industry was the starting point for triple helix collaborative R&D in developing indigenous military technology in Nigeria. Unfortunately, after the civil war, the country failed to further develop the ingenuity efforts of the Biafran engineers and scientists. This situation adversely affected the development of indigenous military technology in Nigeria.

23. In realization of the benefits of indigenous military technology during the civil war; by 1970 an R&D unit of the Nigerian Army (NA) was established under the Technical Group, Nigerian Army Electrical and Mechanical Engineers (NAEME). The objective was to achieve local production of equipment and the evaluation of imported technology.

24. Similarly, the Department of Research Development Test and Evaluation (DRDT&E) was also established in Headquarters Training and Doctrine Command (TRADOC) in 1981. The department was to conduct research and serve as coordinating Centre for test and evaluation as well as quality control of NA equipment. About the same period in 1981, the NA Systems and Development Centre (NASDC) was established to undertake the design and production of modern and secured communication systems that could be deployable within the NA communication network (Olawumi, 2024). The establishments of these NA outfits were to provide the needed structure to aid the development of indigenous military technology in the NA through R&D.

25. Furthermore, the Nigerian Navy (NN) and the Nigerian Air Force (NAF) in pursuit of indigenous military technology also established the Nigerian Naval Dockyard in 1969 and the NAF Technical Training Group in 1977 respectively.

26. In 2007, the NN at the Naval Dockyard, embarked on a Seaward Defence Boats project which gave rise to the construction of 31meter Seaward Defence Boat (SDB), named NNS ANDONI. The NN has since produced additional versions with improved capabilities such as NNS KARADUWA and NNS SAGBAMA. (Onukwuru, 2024).

27. In anticipation of the need for a strong technological base and appropriate qualified manpower to drive her future plan for development of indigenous capabilities; the NAF upgraded the former TTG to Air Force Institute of Technology in partnership with Cranfield university, United Kingdom. Some

selected officers were given the opportunity to pursue MSc and PhD programmes in Aerospace and Aircraft Engineering.

28. Thus, with the improved structure and knowledgeable manpower, the NAF launched its Unmanned Aerial Vehicle (UAV) project with the production of AMEBO and improved versions named GULMA and TSAIGUMI in December 2013 and February 2018 respectively. They were designed to be used for Intelligence, Surveillance and Reconnaissance (ISR). However, the TSAIGUMI could not be operationalised because of the absence of some technical components that were considered as intellectual properties of the partnering company from Portugal. Several unsuccessful efforts were made to address this gap.

29. During my tenure as the Chief of Aircraft Engineering, Headquarters Nigerian Air Force (2015 – 2017). The Branch initiated several R&D efforts towards enhancing the operational capabilities of the NAF in the heat of the North East insurgency operations. Some of these R&D efforts are:

a. Overhaul of Alpha Jet Brake Assembly.

b. Weaponization of 3 Alpha Jet aircraft delivered in 2015 without weapon delivery capabilities.

c. Design and production of Alpha Jet bomb release pyro cartridges.

d. Reconfiguration of the Western bloc pilots helmet connector/pin to the Eastern bloc platforms connector/pin while also eliminating the challenge of impedance.

e. Weaponization of the MI-17 transport Helicopter and the Bell Helicopter.

30. All these R&D efforts were problem solving R&D aimed at addressing identified problems that were hindering ongoing operations in the North East

and North West. While problem solving R&D is good, it is advisable for practitioners to be visionary (anticipatory) and strategic. Anticipatory R&D takes into consideration, contemporary and future threats. It enables you to develop capacities and capabilities in form of technology either to counter future threats or deploy superior military technology against a potential adversary. This kind of feat cannot be attained in silos. It requires collaborative R&D in form of Triple Helix or Quadruple Helix Model which involves the Government, Academia, Industry and the End User.

31. Unlike the Industry role in Quadruple Helix Model, most of the defence related industries in Nigeria operate in silos and purchase research outcomes from foreign research institutions. Also, most of them operate as assembly plants importing their components in form of Semi Knock Down (SKD) or Complete Knock Down (CKD). In such situations, it would not be possible to develop indigenous technologies as the local content is less than 10 percent. With this kind of arrangements and the silo efforts from the Services; the desire for the attainment of near self-reliance in military technology would be an uphill task.

32. There was therefore the need to establish an R&D coordinating body to coordinate indigenous R&D efforts of the Services and research Centres as well as the defence related Industries towards attaining near self-reliance in military technology and defence production. Thus, Defence Research and Development Bureau (DRDB) was established in 2017.

33. Seven years after the establishment of the Bureau, the AFN is still heavily dependent on foreign military technology and equipment. This slow pace of development is of concern especially when one considers how similar organisations in India, Turkey and Israel enhanced the development of military technology in those countries within few years of their establishment as can be seen in the case studies below.

DEVELOPMENT OF INDIGENOUS MILITARY TECHNOLOGY - INDIA TURKEY AND ISRAEL AS CASE STUDIES

34. I have chosen India, Turkey and Israel as case studies because of the substantial attention these countries have given to the development of indigenous military technologies in the phase of emerging threats.

INDIAN DEFENCE INDUSTRY

35. India's defence industry is primarily controlled by the government. The government provides the enabling environment. The industry is organised into 2 sectors: The manufacturing sector and the Research and Development sector. The manufacturing sector is largely dominated by the Defence Public Sector Units (DPSU) and the ordnance factory board. The R&D sector is solely controlled by the Defence Research and Development Organisation (DRDO).

36. DRDO was established in 1958 to serve as a defence R&D hub which develops defence technologies systems or products that are required by the India Armed Forces. DRDO is headed by a seasoned civilian Engineer or scientist with defined tenure. A separate department of Defence Research and Development (DRDD) was formed in 1980 to administer DRDO and its about 50 laboratories and establishments. DRDO has a human resource base of 21,730 including a cadre of 6,713 scientists and engineers (Laxman, 2024).

37. R&D activities in the Indian Armed Forces are coordinated by the DRDO. Additionally, DRDO collaborates with the academia and the industries for defence related researches. Funding for R&D is provided by the Indian Government through the Technology Development Fund (TDF) scheme established in 2015 under the Ministry of Defence. Between 2005 and 2018, the Indian Defence R&D allocation increased from about 12 to 31 percent to reflect the new direction on development of indigenous military technologies. Her 2024 budget was approximately US$2.86 billion. Currently, DRDO provides over 40

per cent of military technology requirement of Indian Armed Forces (Laxman, 2024).

38. Furthermore, the government policy of 'Make in India' which encourages defence industry Original Equipment Manufacturers (OEM) to invest in India defence sector has immensely contributed to the development of indigenous military technology.

39. The possible lessons for DRDB from DRDO India include the following:

a. DRDO has about 50 laboratories.

b. DRDO has defined tenure for the civilian CEO, who is usually an engineer or scientist.

c. DRDO has over 6713 scientist and engineers employed in the organisation.

d. DRDO collaborates with the academia, industries, government and the Armed Forces of India.

e. DRDO has access to government established fund known as Technical Development Fund in addition to her annual budget appropriation. The fund is used to finance special projects.

f. Government policy initiative of 'Make in India' encourages potential OEMs in defence manufacturing to establish their industry in India. Also, it encourages the Armed Forces and the security Services to patronise indigenous military technologies as their first choice except when such is not available in India.

TURKISH DEFENCE INDUSTRY

40. Turkey's modern development of its defence technology and industrial base began in 1974 following US imposed sanctions for its invasion of Cyprus

(Redet, 2024). Unable to acquire the equipment it needed to confront threats to its national security. The Turkish government had to look inwards. Thus in 1985, the Defence Industry Development and Support Administration Office (SAGEB) was established to enable the modernisation of Turkish Armed Forces through the development of indigenous military technology.

41. This Institution played a significant role in transferring and developing military technologies for the Turkish Armed Forces. SAGEB having a very flexible structure adopted a completely new defence industry concept that paved the way for strategic planning. The priority was to maximise the use of national industry infrastructure as well as encourage new advanced technology investments. This initiative gave rise to rapid advancement in indigenous military technology.

42. The Turkish defence industry structure that enhanced the development of indigenous defence technologies was modelled along the Quadruple Helix Model which encouraged collaborative R&D between 4 stakeholders namely; the government, military, defence industries and research institutions. The government as the decision maker provides strategic direction and funding, while the project initiation and conceptualization comes from the military. The technology advancement is the product research efforts of the research institutions, while the industries execute the production of approved R&D outcomes.

43. To further accelerate the development of indigenous military technology, the Turkish government in 2011 instituted the Defence R&D Roadmap for the military. The roadmap serves as a policy framework that provides guidelines for the allocation of resources, prioritization of R&D projects and collaboration with industries, universities and research organizations.

44. The possible lessons for DRDB from the Turkish Defence Industry include the following:

a. Military R&D leveraging on National Industries and Infrastructure.

b. Quadruple Helix Model of military R&D collaboration.

c. Special funding by the government for defence projects.

ISRAELI DEFENCE INDUSTRY

45. I will briefly look at the unique collaboration between the Israeli military R&D, the industry and the Intelligence Community.

46. In Feb 2024, Hezbollah's Secretary General at the time, Hassan Nasrallah, instructed the group members to use pagers instead of cell phones, claiming that Israel security has infiltrated their cell phones network. Hezbollah then purchased Taiwanese Gold Apollo AR 924 pagers and walkie talkie about 5 months before the explosion. The Israeli intelligence agency (MOSSAD) had secretly manufactured the devices, integrated the explosive PETN into the devices and sold them to Hezbollah through a shell company.

47. On 17 and 18 September 2024, thousands of handheld pagers and hundreds of walkie talkies intended for use by Hezbollah exploded simultaneously across Lebanon and Syria in an alleged Israeli attack. As at 22 September, 42 persons were confirmed dead with over 3,500 persons injured including Iran's ambassador to Lebanon (Nasea, 2024).

48. The Taiwanese company denied producing the pagers and walkie talkies. They said a Hungarian company was licenced to use the brand. Meanwhile, the Hungarian company also denied the claim. It's not the first time Israel is

weaponizing communication devices. It used an exploding phone to kill a Hamas bomb manufacturer in 1996 (Nasea, 2024).

49. Some of the possible lessons for DRDB from Israeli Military R&D are as follows:

a. Integration of Military R&D with the Intelligence Community.

b. Proactive Military R&D to counter emerging and future threats.

c. Collaboration of Military R&D with operational units, intelligence units, industries and the government.

d. Government funding intervention in Military R&D.

ESTABLISHMENT OF DEFENCE RESEARCH AND DEVELOPMENT BUREAU

50. Before 2017, DRDB was a department under the Defence Headquarters. It was then known as Department of Research and Development, headed by Chief of Research and Development. At the peak of the counter insurgency operations between 2014 and 2016, Nigeria's efforts at acquiring the right capabilities were delayed or entirely refused by some OEMs. Accordingly, in 2016, the then Chief of Defence Staff General Gabriel Abayomi Olonisakin set up a committee to look into the establishment of the Defence Research and Development Bureau.

51. Following the submission of the committee's report, in 2017, the Bureau was established and charged with the responsibility of initiating, conducting and coordinating robust R&D in defence and security related areas in order to develop unique indigenous defence technologies and defence solutions to manage emerging threats.

52. I was subsequently, appointed the pioneer Director General of the Bureau to drive this vision. With guidance of the then CDS, we had to formulate the

objectives, functions, mission, vision and motto of the Bureau as well as also review the existing structure and manning in order to reposition the Bureau from its former status towards achieving the new mandate.

OBJECTIVES OF THE BUREAU

53. Some of the objectives of the Bureau include:

a. Conduct and coordinate robust research and development in the Armed Forces of Nigeria.

b. Coordinate the research and development efforts of the three Services of the Nigerian Armed Forces.

c. Crystalise the results of scientific and technical research on defence items and equipment for public and private institutions.

d. Provide scientific and technical information to the Armed Forces of Nigeria and allies.

e. Initiate new scientific, technological and environmental research on defence matters.

f. Collaborate with universities in scientific and technological research.

g. Collaborate with other national and international institutions in the promotion and transfer of science and technology relating to defence amongst others.

VISION MISSION AND MOTTO

54. **Vision**. The vision of the Defence Research and Development Bureau is to become an internationally recognised research and development Centre capable of meeting Nigeria's defence and security needs while leveraging on the expertise of indigenous and international partners.

55. **Mission**. The mission statement of the Bureau is to provide strategic direction for self-reliance in defence and security needs through research and development.

56. **Motto**. The motto of the Bureau is: Innovation, Partnership, and Self-reliance.

ORGANISATIONAL STRUCTURE OF THE BUREAU

57. The inherited structure of the Bureau at inception was as follows:

a. Office of the DG/CEO.

b. Directorate of Research.

c. Directorate of Development and Production.

d. Directorate of Test and Evaluation.

e. Directorate of Admin and Logistics.

f. Directorate of Finance and Accounts.

58. We realised that, the way the 3 technical directorates were structured, the directors were not likely to be proactive, innovative and creative. Hence, there was the need to restructure the technical departments to enable them maintain touch with their Services R&D needs and projections. This gave rise to the following technical directorates amongst others:

a. Directorate of Land Research.

b. Directorate of Maritime Research.

c. Directorate of Aerospace Research.

d. Directorate of Special Projects.

e. Directorate of Liaison.

MANNING

59. On assumption of office, I carried out a review on the qualifications and specialist training of the staff I inherited. I discovered from their qualifications that most of the officers had no business being in DRDB, but were posted on punishment grounds. I went to see the then CDS and requested that something urgent be done to correct the anomaly, if not the vision can be considered dead on arrival. In other climes, the very best is posted to the research and development agencies.

60. Another challenge faced in the area of manning was the frequent posting of personnel. Some of these postings were unavoidable because of the career progression of the affected officers. This situation caused loss of institutional memory in some collaborative projects with other organisations. In order to address this situation, we recommended the recruitment of civilian staff and gradual replacement of key technical directors with civilians or retired personnel to achieve a more permanence nature in the manning.

DEFENCE RESEARCH AND DEVELOPMENT BUREAU EFFORTS AT DEVELOPING INDIGENOUS TECHNOLOGIES

61. DRDB operated between 2017 and 2022 without an enabling Act. After several efforts at passing the DRDB bill, the establishment Act was finally signed in January 2023. The DRDB Act 2023 provides the legal framework for the Bureau.

62. As enunciated in the Act, DRDB is mandated to develop appropriate military technology either through indigenous or foreign collaboration to enhance the operations of the Armed Forces. Accordingly, DRDB under my watch collaborated indigenously with industries, academia, private sectors and some foreign organisations to develop unique technologies for the Armed Forces. Some of these collaborative efforts include:

a. Collaboration with Centre for Energy Research and Training (CERT) Zaria as well as the DRDO, India for the development and production of the Time Gated Rahman Detection MKM-1 which is the Improvised Explosive Device Detector (Project FITILA).

b. Design and Development of Military Graded Air Boat.

c. Production of Meals Ready to Eat (MRE).

d. Design and development of Military Graded Vehicles in collaboration with Messrs Innoson and AFEME.

e. Design and production of Ballistic Protective Equipment in collaboration with Messrs Geomine Technology Company.

f. Establishment of 3-Dimensional Additive Manufacturing Centre.

CHALLENGES TO DEVELOPMENT OF INDIGENOUS MILITARY TECHNOLOGY IN NIGERIA BY DEFENCE RESEARCH AND DEVELOPMENT BUREAU

63. From the earlier overview and the lessons from the case studies; there are some challenges that hinder the development of indigenous military technology in Nigeria by DRDB. These challenges include:

a. Inadequate laboratories.

b. Low level of collaborative R&D between the academia, industries and government.

c. Low level of national industrial and technological base.

d. Lack of implementation of government policies on patronage of indigenous technologies.

e. Lack of special R&D funds for development of indigenous technologies.

f. Poor integration of military R&D with the Intelligence Community and the Services Headquarters.

g. Absence of data on capabilities of industries and Research Centres.

h. Absence of Specialised Manpower and Talent Hunt Competition.

INADEQUATE LABORATORIES

64. It is important that a nation's defence production capability be aligned with its current and perceived threats; otherwise, the nation will continue to depend on foreign defence solutions. The emerging threats require unique military technology to tackle them. These technologies which are products of R&D require specialised laboratories to advance the R&D efforts. Without laboratories, most R&D efforts are unachievable. This was one of the reasons why we approached the India DRDO in Project FITILA to use their military grade photonic laboratory. It was also the reason we established the 3D Additive manufacturing laboratory and the airboat laboratory in DRDB as the DG. Despite these efforts, DRDB still phases the challenge of inadequate laboratories.

65. Drawing from the lesson of DRDO that has over 50 laboratories; DRDB would require top class modern laboratories to enhance her R&D efforts in developing indigenous military technology.

LOW LEVEL OF COLLABORATIVE RESEARCH AND DEVELOPMENT EFFORTS

66. Though DRDB has made some giant strides in developing unique technologies; her efforts have however been hindered by the low level of collaborative R&D by the Services and DRDB. Most of the R&D efforts in the Services are in silos. In some cases, they collaborate with universities without advancing the product of research to industries for further development and production.

67. Drawing from the lessons of the DRDO and the Turkish defence industry in the Quadruple Helix model of collaboration; low level of collaborative R&D by DRDB is a challenge.

LOW LEVEL OF NATIONAL INDUSTRIAL AND TECHNOLOGICAL BASE

68. The technological advancement of DRDB and the Services would to a large extent depend on the technological and industrial base of the nation. The low level of industrial and technological base of the nation is a challenge to the development of indigenous military technology in Nigeria. Accordingly, the government would need to take some strategic steps in improving the technological base of the country.

69. Since steel industry is a major requirement for industrial growth of a nation; the government could revisit the option of revitalizing the Aladja steel industry or move away completely and commence a modular steel project that could address some immediate steel needs of the Nigerian Defence Industry. I am however aware of the recent discussions with the Russians and the Chinese in revitalizing the Aladja steel and the commencement of a modular steel industry respectively.

LACK OF IMPLEMENTATION OF GOVERNMENT POLICIES ON PATRONAGE OF LOCAL TECHNOLOGIES

70. The thrust of the Executive Order 5 is the promotion of indigenous technologies and innovation. The Ministries, Departments and Agencies (MDAs) were mandated by this order to patronise local content and local technologies. Similarly, DICON ACT 2023 mandated the AFN to patronise the products of DICON. The challenge with these policies are in their implementations. Without appropriate sanctions, the MDAs are not likely to patronise these indigenous technologies.

71. As the DG of DRDB, we collaborated with ERISCO foods to manufacture Meals Ready to Eat (MRE). So much effort and resources were put into this initiative; however, only the DHQ patronised this product after so much resources had been invested. All efforts to get the Services to patronise the product was unsuccessful.

72. Drawing lessons from India; in 2014, Prime Minister Nasendra Modi's government launched many reforms under the 'Make in India' initiative to strengthen Indian Defence industry. This policy compels the Armed Forces to first patronise indigenous technologies. It's only when required technology is not available within the country that they could patronise foreign technologies. Another benefit of this policy is that it has encouraged so many OEMs to shift their manufacturing bases to India in order to have an in-route into the India defence market. Thus, the absence of implementation of government policies on patronage of indigenous technologies in Nigeria is a challenge.

LACK OF SPECIAL RESEARCH AND DEVELOPMENT FUNDS

73. The DRDB's annual appropriation that covers both capital and recurrent expenditures is usually based on the budget envelop form. The appropriation is not sufficient to fund the R&D projects of the Services as the Services do not receive any appropriation for R&D. Unlike India and Turkey, Nigeria does not have any special R&D funds for DRDB and the Services to access.

74. However, TETFUND maintains a national R&D funds (NRF) worth about 8.5 billion naira annually. This fund can only be accessed by government tertiary institutions. There is therefore the need to initiate a national R&D foundation which would provide research funds for all sectors of the economy like India and Turkey.

POOR INTEGRATION OF MILITARY R&D WITH THE INTELLIGENCE COMMUNITIES

75. The poor or complete absence of collaboration between the military R&D, military operations and the intelligence communities is a challenge to developing appropriate indigenous military technology in Nigeria.

76. One of the lessons from the case study of the Israeli defence industry is the integration of military R&D with military operations and the intelligence communities. The collaboration helped the R&D team to anticipate and develop appropriate military technologies to manage emerging threats.

ABSENCE OF DATA ON INDUSTRIES AND RESEARCH CENTRES CAPABILITIES

77. My involvement in the military R&D ecosystem revealed that there are many industries in Nigeria with installed capacities in defence related production, but unknown to the AFN. In most cases, there are no data on industries and research centre capabilities as well as their equipment. DRDB would need to collate data on these industries in order to collaborate and leverage on their facilities.

78. In 2015, during my R&D on Alpha Jet brake assemblies; I reached a critical point where I needed a specialised equipment to integrate the brake components. I contacted my classmate in the university, who recommended Innoson Motors facilities in Enugu and Nnewi. With Innoson facilities, we were able to successfully complete the R&D on the Alpha Jet brake assemblies which eventually improved the serviceability status of the NAF aircraft fleet. There is therefore the need for DRDB to network and collate data on various capabilities in industries and research Centres.

ABSENCE OF SPECIALISED MANPOWER AND TALENT HUNT COMPETITION

79. The absence of specialised manpower and Talent Hunt competition is a challenge. DRDB would need to consider conducting talent hunt competition for gifted Nigerians in various fields of technology. This could be achieved through attractive competitions as we did in 2020 in Jaji in the area of UAV Technology. The outcome was very rewarding. I would volunteer my Centre for Innovation and Creativity Challenge, to help DRDB in the planning and the execution when they are ready.

80. The truth is that you cannot achieve extraordinary breakthrough in technology with unspecialised routine staff. You may wish to consider adhoc committee of specialist drawn from outside the Bureau to drive some of your special projects. We did that in the case of project FITILA.

THE WAY FORWARD

81. In proposing the way forward, I have decided to separate those challenges that could be addressed directly by DRDB and the Services from those that falls within the responsibilities of the Federal Government. At the government's level, the FG needs to focus more attention and provide enabling environment for industrial and technological growth of Nigeria as well as clearly defining and pursuing the nation's intentions towards self-reliance in defence production.

82. While commending the government recent effort in the signing of the new DICON Act 2023; a lot more still need to be done to actualise the dream of a Military Industrial Complex (MIC). Since the defence technologies of nations depends on the technological base of the nation which the defence industries could leverage on. The government would need to urgently consider the development of a modular steel industry in her first phase of the steel industry development. This modular industry could be completed within 2 years from

conceptualization, signing of contracts to the completion of the facility. It is expected that this modular facility would address the immediate steel need of the country both in the civil and defence sector.

83. Additionally, the government would need to redirect the focus of some government agencies that were established to enhance industrialisation and technological growth of the nation. One of such agencies is the National Agency for Science and Engineering Infrastructure (NASENI). The Agency was established to provide science and engineering infrastructures for MDAs and industries to enhance the advancement of national industrial and technology growth. Though NASENI has some credible facilities spread across the country; it appears to have lost focus on her established mandate. The government would need to redirect their focus to their mandate such that DRDB, DICON and the Services could leverage on their science and engineering infrastructure towards developing indigenous military technology.

84. Furthermore, the government would need to consider the establishment of an R&D foundation for the funding of R&D efforts in all the sectors of the economy. The United Nations recommended value is one to 2 per cent of the GDP. The Foundation should be known as National R&D Foundation (NRDF) from which DRDB and Services could draw funds for their special projects.

85. To achieve the foregoing, it is imperative that a Presidential Council on Defence Technology be established to be chaired by Mr President. Additionally, a Ministry of Defence Technology and Production be established, to be headed by a scientist or an engineer with knowledge and experience in Defence R&D and Technology.

86. Members of the Presidential Council on Defence Technology to include the Honourable Minister of Defence Technology and Production, Minister of Science and Technology, CDS, Service Chiefs and IGP. Others are, DG DRDB, DG DICON,

Chief of Space Administration, Chief of Defence Intelligence and DG, Department of States Services as well as the DG, National Intelligence Agency. Mr President with these critical stakeholders could fashion out a roadmap for the development of indigenous military technology in Nigeria. The DG DRDB could request the CDS to impress on the National Assembly Committee on Defence to sponsor a bill for the setting up of the Presidential Council on Defence Technology and the Ministry of Defence Technology and Production.

87. In addition to the establishment of the NRDF; DRDB could also leverage on the proposed R&D funds in the Nigerian National Defence Policy 2017, which recommended 15 percent of annual capital expenditure budget of the Ministry of Defence. DRDB could seek for a formal legislative backing from the National Assembly. Additionally, this 15 per cent should not be deducted from the total capital budget of the sector; rather, it should be a fresh addition to the envelop of the sector's annual capital expenditure budget.

88. Let us now consider some of the proposed actions to be taken by DRDB to mitigate the challenges. Starting with the establishment of laboratories. Laboratories are essential requirements for R&D and subsequent acquisition of indigenous technology. It is therefore necessary for DRDB to establish key military grade laboratories to enhance her R&D efforts. Pending the establishment of the NRDF, DRDB could achieve this initiative either through Ministry of Defence supplementary budget for special projects or through annual capital appropriation for at least 2 to 3 laboratories annually.

89. Next is the application of the Quadruple Helix Model. Most nations with advance military technology, leverage on collaboration between the academia (Research Centres), industry, military (End Users) and the government. In this case, DRDB would conceptualise and initiate R&D efforts with the research Centres based on the need of the Services and report of the Intelligence

Communities on the nature of emerging threats. The outcome of the research effort would be further developed and produced at the industry and delivered to the End User, in this case, the military. It is expected that the government would provide the enabling environment in form of national industrial base, infrastructures and appropriate funding. The application of this Quadruple Helix model approach to collaborative R&D by DRDB would enhance her attainment of indigenous military technologies.

90. Furthermore, in addition to Executive Order 5 and the new DICON Act 2023, DRDB through the CDS could recommend to the government to consider the launch of "Make in Nigeria" initiative. This initiative which would be backed with sanctions would encourage more OEMs in Nigerian defence market. It would also encourage the Services and other security Services to patronise indigenous technologies in view of the government sanctions for non-compliance.

91. Additionally, it is important for DRDB to consider as utmost importance the development of data base on competence and capabilities of industries and research centres. The data base would also record state of the art equipment, where they are located and for what purposes. Also, it would record common user facilities and equipment. DRDB could achieve this by tasking one of her departments or creating and entirely new cell to handle this initiative.

92. Furthermore, the involvement of the Intelligence Communities in the planning of military R&D would enhance prioritization of R&D projects and the choice of technology as well as the timely deployment of the produced indigenous technologies. The DG DRDB could request the CDS to impress on the National Assembly Committee on Defence to sponsor a bill for setting up the body of Military R&D with Intelligence Communities. In the meantime, pending the establishment of this new body; DRDB could collaborate with DIA and the

operational units in order to timely anticipate appropriate technologies to manage emerging threats.

93. Lastly is the provision of specialised manpower and the conduct of talent hunt competition. I am aware of the recent efforts by DRDB to fill up her civilian manpower requirements. This is very commendable especially when viewed from the need for permanence against frequent posting of serving personnel. This initiative can only be fruitful to the Bureau after the civilian staff have been given appropriate specialised training that would enable them to function in the R&D ecosystem. In the meantime, DRDB could consider hiring adhoc specialised manpower to handle some of her specialised R&D projects.

94. Specialised skills could also be discovered through Talent Hunt competition with attractive rewards. In this regard, the Centre for Innovation and Creativity Challenge could collaborate with DRDB to organise the competition and select talented Nigerians that could add value to the R&D efforts of DRDB.

CONCLUSION

95. Technology has over the years enhanced the development and national security of nations. Most contemporary industrialised societies of the world referred to by many as the ''First World", are enjoying such status principally due to various technology feats in the defence and other sectors. These technological feats are driven by focused and collaborative R&D. Accordingly, most nations with advanced military technology invest heavily in military R&D through their defence R&D agencies to enhance self-reliance in indigenous military technology and equipment.

96. In 1964, Nigerian government established the DICON to enhance indigenous defence production. Several years after the establishment, the

country was still heavily dependent on foreign defence solutions and equipment. In order to address the nation's high dependence on foreign defence solutions; DRDB was established in 2017 to enhance the development of indigenous military technology through R&D. The Bureau had since made some efforts in this regard albeit some challenges.

97. The challenges include inadequate laboratories, low level of collaborative R&D, poor national industrial and technological base and lack of implementation of government policies on patronage of indigenous technologies as well as the lack of special R&D funds and poor integration of military R&D with intelligence community. These challenges would need to be mitigated so that DRDB could achieve some reasonable level of self-reliance in indigenous military technology. Accordingly, I have proffered the way forward.

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