

**AFRICAN MILITARY AND THE PRODUCTION OF INDIGENOUS WAR EQUIPMENT: THE CASE OF THE NIGERIAN ARMY, 2015-2021**

Hussaini Jibrin, PhD  
Department of History and War Studies  
Nigerian Defence Academy, Kaduna.

Bashir Abu Sabe, PhD  
Department of Nigerian Languages  
Umaru Musa Yar'adua University, Katsina.

Muhammad Murtala Liman  
Department of History and War Studies  
Nigerian Defence Academy, Kaduna.

**Abstract**

One important issue that occupies a centre stage in understanding of the international politics in the 21<sup>st</sup> century has been the development of Science and Technology for production of military hardware among the armed forces of nations. However, in Africa, lack of effective developments in Science and Technology retards the efforts of the military in addressing the numerous security challenges bedevilling the continent. Over reliance on developed nations for the supply of sophisticated weapons to fight organized crimes has always come with so many challenges ranging from high costs of the required War equipment, bureaucratic procedures, transportation to Africa, conspiracy associated with the supply among others. These have made it necessary for some African militaries to change focus from over reliance on the developed nations in the procurement of military hardware to local productions. This article therefore, examines the role of the Nigerian Army in the production of weapons in Nigeria in the fight against insurgency, 2015-2021. The findings prove that African scientists and technologists can make changes in the wrong Eurocentric perceptions that weapons production cannot be possible in Africa. The paper also reveals that the hardware productions at the Command Engineering Depot (formerly, Nigerian Army Workshop) Kaduna and some individual Research and Development (R&D) among the personnel in the Nigerian Army have led to the production of sophisticated weapons tested at the Northeast theatre of war even though, there is the needs for improvement. The paper adopts primary and secondary sources of data collection in historical analysis.

**Introduction**

Among the major Corps in the Army, the Engineers are the most versatile component which fight and also provide enabling environment for other Corps to fight against the enemy. This is why Army Engineers claim that, they are soldiers, builders and managers of military facilities. In historical perspective, they are simply described as soldiers of the sword, shovel and compass. Their three basic functions are: military or combat engineering, construction or civil engineering and survey. Thus, the Engineers help the Army to live, move and fight whilst doing everything possible to hinder the movement of the enemy. To help the Army to fight, the Engineers carry out the following tasks: bridging of small gaps ranging from 10-30 metres wide using portable bridging equipment like the Bailey Bridge and medium Girder Bridge, and demolition of obstacles using explosives. To enable the Army, live, engineers carry out task like provision of potable water, construction and maintenance of buildings including bunkers in the battle fields. Most of these tasks require a degree of individual artisan skills on the part of the soldier such as carpentry, plumber service, bricklaying etc. To give the

Army mobility in the battle field, the Engineers construct laterite roads or unsurfaced roads with adequate compaction to enable vehicles drive on them. The Army Engineers also provide maps and other survey services required in operations. Above all, the Army Engineers because of their expertise also take part in civic action programmes when requested by the Civil Authorities.<sup>2</sup> In Nigeria, the Headquarters of the Nigerian Army Engineers (NAE) coordinates all military engineering activities in the Army. Units are assigned responsibility for the performance of the above listed tasks. The units are provided with relevant equipment for the tasks assigned to them. Example, construction plants like dozers, graders etc for horizontal construction, concrete mixers, and so on. Cranes, tools boxes c for vertical construction, explosives and bridging equipment.<sup>3</sup>With the outbreak of the war against Boko Haram insurgency in the Northeast geo-political zone in 2010, the NAE demonstrated expertise and professionalism at the battle fronts. They built roads and bridges in the Sambisa forest, the stronghold of the enemy. They fixed broke down vehicles. They provided portable drinking water and so on.<sup>4</sup>

### **The Problem and Questions**

Lack of awareness of the public about the general activities of military in Nigeria and Africa at large, poses a problem of wider understanding of the roles of armed forces in the continent. Military is a societal institution; hence a professional military is also referred to as *peoples' soldiers*. Absence of close examination of the activities of the military no doubt affects what is termed as the liberal civil-military relations. Thus, creating a lacuna in our knowledge of the African military especially during counterinsurgency operations. To address this, the article raises certain questions such as what has been the place of the Engineering in warfare, nature of the Nigerian Army Engineering before the period under study and the role of the Nigerian Army in the production of war equipment.

### **The Place of the Engineering in Warfare**

Engineering emerged out of the production of tools using iron as a result of the transition or revolution from the stone to the iron age. In the history of warfare, weapons became the instrument upon which campaigns were executed. Thus, the application of engineering became a *sine quo non* through different ways especially manufacturing of weapons for self-defence and expansion of areas of jurisdictions. Sequel to this, different communities with iron ore deposit and even those without it specialized in the production of different weapons depending on the environment where they found themselves. This, explained the variations in the nature of weaponry produced from one part of the world to another since the ancient times till date. However, in the contemporary time, as a result of the development in industrialization, modern nations specialized in the production of weapons of all types because of the development in the geo-strategic study of the world. Therefore, modern nations establish military institutions that defend their territorial integrity from external aggression, terrorists' and insurgents' activities. The capacity of a nation's military is enhanced mainly by factors such as its level of human, material and technological development, among others.<sup>5</sup> For instance, in 1915, the United States of America set up the Department of Scientific and Industrial Research to harness local production of military hardware to enhance the operational efficiency of its military. This has evolved over the years with several military hardware manufacturing outfits emerging, resulting in result-oriented local production capacity and becoming a world superpower. Along this effort, the Research

---

<sup>2</sup>O. G. A. Sam, 'The Involvement of the Army Engineers in National Development', Institute Paper, National Institute of Policy and Strategic Studies, 1993, pp. 33-34

<sup>3</sup>Ibid, pp. 34-35

<sup>4</sup>Interview with Lieutenant Colonel AS Imam, 46 years, Nigerian Army Engineering personnel, Department of Mechatronic Engineering Nigerian Defence Academy, Kaduna, 21<sup>st</sup> November, 2021

<sup>5</sup>Maduegbunam, 2003

and Development efforts of Pakistan culminated in the establishment of a formidable industrialized military hardware factory known as Pakistan Ordnance Factory (POF). The factory sustains the military requirements of the armed forces of Pakistan, thereby making the nation self-sufficient in military hardware production and enhancing operational efficiency of their troops.<sup>6</sup> A few countries in Africa have also embraced the concept of attaining self-sufficiency in military hardware through local production. For instance, South Africa, in the quest to harness local production of military hardware established the Defence Industries Corporation and several manufacturing outfits to enhance local production of military hardware such as aircraft, missiles, unmanned vehicles among others.<sup>7</sup>

#### **Nature of the Indigenous Technology in the Nigerian Army Engineering Before 2015**

In Nigerian military history, production of indigenous weapons can be traced to the period of the Nigerian Civil War, 1967-1970. When the war started, especially after the Midwest invasion by the Biafran rebels, the Federal Military Government (FMC) organized a 3 Marine Commando under Colonel Benjamin Adekunle (Black Scorpion) to recapture the Nigerian territories and to blockade its government from receiving hardware supply through the Atlantic Ocean.<sup>8</sup> This was a successful strategy because within days, the 3 Marine Commando took over the control of the water borders of Nigeria in that direction. The sea blockade created a serious challenge to the Biafrans for the external supply of weapons through the Atlantic water areas.<sup>9</sup> Consequently, this resulted to the establishment of the Research and Development Unit for the production of locally made weapons in the Biafra. In the effort, scientists from the University of Nigeria Nsukka and local blacksmith from different areas of the Biafra demonstrated expertise and intelligence in indigenous production of military equipment. Weapons such as Ogbunigwe, small arms and ammunitions were manufactured and adequately utilized against the federal forces.<sup>10</sup> Unfortunately, with the end of the war, these efforts were put to death. This was as a result of certain historical epochs which among, perhaps due to the decades of peace enjoyed in the country and military involvement in the nation's politics.

#### **Nigerian Army and the Production of Indigenous War Equipment, 2015-2021**

By 1999, Nigeria returned into democratic rule after about three decades of military rule. With this development, apart from few ethno-religious conflicts which were accompanied by political transitions during elections, there was no serious crisis which required the deployment of military in a large magnitude to combat the situation. However, in 2009 there broke out a serious conflict between the Nigerian security agents and a radical Salafi Islamic group known as *Jama'atu Ahlusunnah li Da'awati wal Jihad*, meaning (People Committed to the Practice of Prophetic teachings and Holy War) in the city of Maiduguri, the capital of Borno state.<sup>11</sup> According to their doctrine, the failure of the Nigerian elites in the development indices of the society especially in the absence of the provision

---

<sup>6</sup>Test Flight and Development Center Saaf, ISBN: 6200802610, pp 12.

<sup>7</sup>RSA Department of Defence, 2016.

<sup>8</sup>See, Nigerian Army Education Corps and School (NAECS), *History of the Nigerian Army*, Abuja: NAECS, 1992.

<sup>9</sup>See, Obasanjo, O. *My Command*, Ibadan: Heinemann, 1987.

<sup>10</sup>See, Godwin, A.I. *The Tragedy of Victory: On-the-Spot Account of the Nigeria-Biafra War in the Atlantic Theatre*, Ibadan: Spectrum Books Limited, 2013.

<sup>11</sup>Boko Haram is a Salafi sub-group of the Sunni Muslims who believe in radical interpretations of the scripture, just like other radical sects in Abrahamic religions. Example, the Zealots in Judaism.

of social amenities such as portable drinking water, electricity, qualitative education, roads, jobs creation and so on, despite the available resources in the country was because of they acquired western education. In fact, it is the western education that made people to loot public treasury and encourage all sorts of social injustices. Due to these, radical misconception of the scripture, other Muslims around them referred to them as Boko Haram which in means *Western Education is forbidden.*' But they hate to be identified with the name. In response to the activities of the Boko Haram, the Nigerian government pursued them out of the city of Maiduguri, an event which made them to establish a stronghold at the Sambisa forest.<sup>12</sup>

Couple with the long period of bad governance that resulted to the endemic poverty, illiteracy among the Nigerian youth, the Boko Haram got an easy way of recruiting thousands of fighters around the villages of their hideouts especially in Borno, Yobe and Adamawa states. Thus, they established strong guerilla fighters who threatened peaceful coexistence among the Nigerian and neighboring countries populace. At the heyday of the Boko Haram insurgency in 2013 and 2014, they inflicted lot of casualties on the Nigerian Army, so much so that, at a time, the troops were losing the war and were losing interests on the military job.

By 2015, there was a change of government in Nigeria. This was a democratic transition from the People's Democratic Party (PDP) to All People's Congress (APC). One of the major steps taken by the APC government to address the Boko Haram insurgency was the change of the three Service Chiefs of the Nigerian Armed Forces (the Army, the Navy and the Air Force). In the Army, Lieutenant General TY Buratai was appointed as the Chief of Army Staff (COAS). Now, one of his major transformation in the Army to become more striking force immediately he assumed duty was promoting local production of military hardware through R&D. The reasons to this have to do with the denial of some developed countries to sell Nigerian government the sophisticated weapons to fight the insurgency. Consequently, he redirected his attention to local production. He unveiled this while addressing troops at the 7 Division Tactical Headquarters in Bama in 2015 when he declared that:

The Contemporary geostrategic environment that the NA is expected to fight is complex and dynamic, requiring reinvigorated efforts towards local production of requisite fighting equipment through R&D.

The areas he outlined include the development of Unmanned Aerial vehicles (UAVs), Mine-Resistant Ambush Protected (MRAP) Improved Explosive Devices (IEDS) detection equipment, static surveillance equipment, food processing (food canning and packaging., etc.), and fabrication of weapons and alternative/renewable energy sources (portable hydro, bio, solar, diesel, etc). Other areas include Special Forces weapons and accessories, tentages, field accommodations/conveniences, communication/transmission equipment communication intercept/jamming devices, bomb/metal/thermal detection capability, pre-fabricated building materials for barracks/office accommodation water treatment capability for units, perimeter security and defence mechanisms and cyber security capabilities, amongst others. To demonstrate this determination, he released funds across the Nigerian Army to individual researchers, units and formations for the actualization of his dream on R&D. This was with keen interest on these at two major events are: the Innovative Addition in R&D and Exhibition in the highlights of the "Nigerian Army Day Celebration (NADCEL) 2016" in Gusau, Zamfara State. At this programme several units, formations and individual researchers,

---

<sup>12</sup> Perouse-de-Montclos, M. ed. (2014), *Boko Haram: Islamism, Politics, Security and the State in Nigeria*, Ipskamp Drukkers, Netherlands

innovators and inventors showcased their R&D efforts. In addition, the Army organized the maiden Nigerian Army Research and Innovation Summit (NARIS) in Abuja between 13<sup>th</sup> and 17<sup>th</sup> March 2017, under the theme "Research and Innovation, Developing Synergy with Indigenous Institutions for Enhanced Capacity in the Nigerian Army". During the summit, several NA units and formations, as well as non-military organizations, exhibited numerous technology-related innovations conceptualized, designed and fabricated in Nigeria and by Nigerians geared towards enhancing the NA capacity in the ongoing counterinsurgency operations. He directed Command Engineering Depot (CED) to collaborate with the capable private and public organizations/companies for R&D towards achieving local production of military equipment.

In this direction, the CED went into collaboration with three public and private organizations, namely Defence Industry Corporation (DICON), Imperium and the Nigerian Defence Academy Defence, Kaduna. Having done that, he funded all R&D initiatives (which reached his table) that contributed toward achieving self-reliance in defence production. Through this, a number of innovative ideas produced a number of products that were displayed to Nigerians and the world at large. In one his visitations to the research areas, General Buratai expressed delight that all the products manufactured by the Command Engineering Depot were fabricated by Nigerians, without foreign technical partners. According to the Army Chief,

This is an achievement that will help to lay a solid foundation for future consolidation on local production of military hardware. Similarly, it will reduce the intractable over-dependence on imported defence logistics.

#### **Achievements of CED in Collaboration with DICON and IIL**

It is undeniable fact that under the leadership of General Buratai, the Nigerian Army in its history, has successfully commenced the manufacture/production of various types of Armoured Personnel Carriers, MRAP, Mine Clearance System, ballistic vests, military boots combat, bullets proof vehicles, ballistic helmets, protective jackets among other military hardware. This feat was achieved through collaborative efforts between CED, DICON and IIL. The details are described below:

#### **Re-design and Conversion of Land Cruiser Vehicles to Buffalo Armoured Vehicles**

In any functional military system, commanders are usually advised to know the capabilities and limitations of their weapon systems so that they can best deploy them. The use and employment of Military vehicles also need to be considered and fully understood. The widespread use of vehicles inappropriate for the operations being conducted in the various front in Nigeria has been witnessed. At the peak period of the Northeast insurgency, troops were subjected to riding soft skin vehicles that did not provide adequate protection. In fact, estimated that more than half the casualties and fatalities so far incurred could have been prevented if troops had been mounted in vehicles with adequate protection. The critical characteristic of a military vehicle is not its weight, or whether it is wheeled or tracked, but its capability. This includes the capacity to operate in the environment deployed and the ability to perform as desired in a mission.

To address this issue, General Buratai mandated CED and its collaborators to look into the re-designing and conversion of Land Cruiser Vehicles to Buffalo Armoured Vehicles. The project began in September 2018 as one pioneer collaborative project between CED and ILL. By February 2019, over ten Land Cruiser vehicles were successfully converted into Buffalo Armoured Trucks. The converted vehicles were deployed to the theatre of war to test their performance and capability. Feedback received from the field test was positive. However, certain observations were raised as a way of improving the performance and reliability of the vehicles.



### Design and prototyping of Light Patrol Vehicles

Military Light Patrol Vehicle, (LPV) is by definition, lighter than other military trucks and vehicles. It is inherently compact and usually has no armour. It features short body overhangs for nimble all-terrain mobility and usually accommodates around 4-passenger. Since the earliest large scale mechanization of the military, hundreds of different light vehicles have been used for military utility services, ranging from readily available commercial products, just repainted in military colours, to purpose-designed vehicles, that were specially developed for military applications and operation in forward areas. Generally, LPV is typically a general or a multi-purpose – used to carry troops, mounted weapons, supplies, evacuate wounded soldiers and many other diverse roles.<sup>13</sup>

To promote indigenous capacity and the local content policy of General Buratai, for the first time in history, the CED in partnership with DICON domesticated the manufacturing of military LPV. During the launch of the vehicles in February 2019, General Buratai said that the Nigerian Army would start exporting the LPVs to other African countries around 2030 after meeting Nigerian Army requirements around 2025.<sup>14</sup> In his remarks, the Managing Director/Chief Executive Officer of CED, Major General VO Ezugwu stated that:

the success marked an indelible milestone in the history of the Army's march towards self-reliance in the production and maintenance of military vehicles as over the years the Nigerian Army has relied on the importation of such vehicles, thereby spending huge foreign exchange which in turn depletes capital allocations.<sup>15</sup>

He added that the company had produced 50 LPVs in the last two months.



### Design and prototyping of Mine Resistant Anti-Ambush Protected (MRAP) Vehicles

<sup>13</sup>Top 10 Military Light Utility Vehicles – Military Today.com". Archived from the original on 2018-06-03. Retrieved 2018-06-18.

<sup>14</sup>Lt Gen TY Buratai, COAS, Speech at the Launching of LPV in Kaduna, 5 February, 2019.

<sup>15</sup>Maj Gen VA Ezugwu, CED MD/CEO, Remarks at the Launching of the LPV in Kaduna, February 5, 2019.

Mine-Resistant, Ambush-Protected (MRAP) vehicles are a family of vehicles produced by a variety of domestic and international companies that generally incorporate a "V"-shaped hull and armour plating designed to provide protection against mines and IEDs. The commonly types of MRAPs are Category I vehicles, capable of carrying up to 7 personnel and intended for urban operations; Category II vehicles, capable of carrying up to 11 personnel and intended for a variety of missions such as supporting security, convoy escort, troop or cargo transport, medical, explosive ordnance disposal, or combat engineer operations; and Category III vehicles, intended to be used primarily to clear mines and IEDs, which are capable of carrying up to 13 personnel. Literature has shown that the US Army and Marines first employed MRAPs in limited numbers in Iraq and Afghanistan in 2003, primarily for route clearance and explosive ordnance disposal (EOD) operations. These route clearance MRAPs quickly gained a reputation for providing superior protection for their crews, and some suggested that MRAPs might be a better alternative for transporting troops in Armoured personnel Carrier (APC). US official report confirms that the casualty rate for MRAPs is 6%, making it "the most survivable vehicle in the US Army inventory.

In his bid to encourage local production of military equipment, General Buratai provided funding to CED, DICON and IIL for R&D into the production of the first indigenous MRAP vehicles named Ezugwu MRAPs. The research outcome was the manufacture of four Ezugwu MRAPs designed to carry out transportation in both smooth and rough terrain, with the capability to assault with a high volume of fire. The vehicles were fitted a 12.7 mm Anti-Aircraft Gun and a 7.62 mm Light Machine Gun as primary armament and carry a crew of 12: commander, driver, two gunners and eight soldiers. The vehicles were well suited for counter-terrorism, maintenance of stability. It is also a perfect vehicle for urban warfare.



#### **Design and prototyping of the Nigerian Army Helicopter Prototype (NAHP) 01**

Helicopters are indispensable, adaptive and versatile air assets held by modern armed forces. Military helicopters play an integral part in the sea, land and air operations of modern militaries.<sup>16</sup> These platforms have wide-ranging by applications in military services such as offensive, reconnaissance, transportation, resupply, medical evacuation and maritime amongst others which necessitated continual innovations in their production. Accordingly, Gunston et al. in their book on "Modern Fighting Helicopter" aver that "the fact that... helicopters are eagerly sought in large numbers by air forces, armies and navies all over the world serve to underscore their values" The versatility and precision weapon systems of helicopters have immensely contributed to defeat of non-state actors in Counter-Terrorism and Counter-Insurgency (CTCOIN) in Syria, Iraq and Afghanistan among others. Generally, manufacturers develop airframes in different weight/size classes which can be adapted to different roles through the installation of mission-specific equipment. To minimize development costs,

---

<sup>16</sup><https://zarconian.fandom.com/wiki/Helicopters>.

the basic airframes can be stretched and shortened, be updated with new engines and electronics and have the entire mechanical and flight systems mated to new fuselages to create new aircraft. For example, the UH-1 has given rise to a number of derivatives through stretching and re-engining the AH-1. Modern helicopters have modular systems which allow the same airframe to be configured for different roles. For example, the EH-101 in Royal Navy service can be rapidly configured for ASW or transport missions in hours. To at the same time retain flexibility and limit costs, it is possible to fit an airframe for but not with a system, for example in the US Army's AH-64D variants are all fitted to be able to take the Longbow radar system, but not enough sets have been bought to equip the whole Force. The systems can be fitted to only those airframes that need it, or when finances allow the purchase of enough units.<sup>17</sup>

Lack of organic air asset in the Nigerian Army has been identified as one of the significant reasons for the prolonged battle with the Boko Haram insurgents. British war hero and former Prime Minister, Winston Churchill succinctly captured the essence of air power in defending a modern state, when he said, "Not to have an adequate air force in the present state of the world is to compromise the foundations of national freedom and independence."<sup>18</sup> Churchill's insight enjoys historical validation by the fact that airpower, is a fundamental component of a nation's armed forces which remains a decisive and critical factor in determining the outcome of any war. This submission validates the Nigerian Army agitation to establish the Army Aviation Corps to quickly and finally bring the Boko Haram insurgents to an abrupt end and wrap up the long-drawn military campaign.

In this regard, General Buratai further demonstrated his belief in the local production of military equipment by funding and supporting the Nigerian Army Helicopter Prototype One (NAHP 01) project. The project commenced on 26<sup>th</sup> April 2016 and currently being undertaken at the CED with Captain SS Ogundele (N/14179) of the NAEME Corps as the lead researcher, and the Commander CED Major General SS Araoye as the project supervisor while Mallam Ahmad Shaibu and 02NA/52/2840 Sgt Shonibre Kayode as research assistants.<sup>19</sup> The project suffered some setbacks at various times of its development and was subsequently halted after its first test and trials as a result of a fatal accident resulting from the failure of the rotor shaft bearing that disconnected the blade from the rotor assembly. The project was later continued with funding and procurement of some needed components. The Commander CED, Major General Araoye, revealed in an interview that with recent financial support received from the COAS, and the subsequent procurement of components, the helicopter is expected to be operational before the year ends.<sup>20</sup>

---

<sup>17</sup><https://zarconian.fandom.com/wiki/Helicopters>.

<sup>18</sup>Winston Churchill British war hero and former Prime Minister.

<sup>19</sup>Capt SS Ogundele, NAPH 01 Lead Researcher, an Interview, 7 July 2021.

<sup>20</sup>Maj Gen SS Araoye, Commander CED, an Interview on 8 July, 2021.





### **Development and Prototyping of a Fuel-less Generator**

Nations and organizations world over faced numerous challenges in the provision of their energy needs. This combines concern for energy economics and affordability with a desire for environmental protection and assured energy security. Addressing this problem has proven to be a difficult challenge for energy policymakers. It is a fact that defence energy and security efforts are more directed at achieving the military mission and strategic objectives. For instance, energy consideration has long been essential to mission delivery of armed forces worldwide. These include operations in a theater of conflict, on land, air, and maritime, as well as for installations and forward operating locations. More recently, the topic has risen around clean energy and new challenges facing the military<sup>21</sup>. Energy enables nearly everything the military does, and the primary objective is mission assurance and decisive advantage on the battlefield. It is certain that security is derived through energy powering capable significant weapons systems and communications infrastructure at the desired levels of performance, range, and readiness. But resupplying energy to combat theatres and the battlespace edge is a vulnerability, so security is also derived through minimizing the energy required for vehicles and forward locations. Reducing and diversifying fuel use are also drivers behind economic considerations of military energy use.

In another development, the world's militaries have also for more than a hundred years taken a leadership role in research and development (R&D), and procurement of emerging technologies – especially where they are applicable in combat theatres.<sup>22</sup> Over many decades that leadership has involved issues relating to energy supply and use. Recently, this interest has expanded to include more robust consideration of resource efficiency and environmental impact. There has been increased emphasis on the development of unconventional energy sources, including renewables for field use. Imam and Abdullahi (2020) have observed that at present, the importance of alternative energy source has become even more crucial matter not only due to the continuous depletion of limited fossil fuel

---

<sup>21</sup>S. Burke The Pentagon's Fuel Fiefdom (2017) New America resource-security/natural-security/pentagons-fuel-fiefdom/ Google Scholar.

<sup>22</sup>J. Birkler, J.B. Garfinkle, K.E. Marks, Development and Production Cost Estimating Relationships for Aircraft Turbine Engines, RAND Corporation, Santa Monica, CA (1982).

stock but also for the safe, better and greener environment.<sup>23</sup> Therefore, in order to find an alternative, way of producing energy in the field for the Nigeria Army, several other options have been considered. One of these alternatives is the fuel-less generator. A fuel-less generator is a device that generates electricity without using fuel (petrol or diesel), and it is not an inverter, solar system or wind energy. In response to this challenge, General Buratai provided funding to CED and its collaborators to embark upon R&D which is aimed at the development and evaluation of a 10 KVA fuel-less generator for the Nigeria Army's field use, which was later named NA Fuel-less Generator (NAFG). The concept of fuel less power generation is not new: it is based on a conductor turning in a magnetic field, which induces a voltage in the conductor due to the variation of flux. However, some losses are experienced in the core and winding of the rotor and stator. The NAFG consists of the power supply unit, conversion, and control unit, output, and charging units. Other components parts include 12V battery, DC motor, alternator, connecting shaft, bolts and nuts, transformer, diode, and noise damper.



### **Development and Prototyping of Mine Rollers for Mine/IED Detonation**

Demining or mine clearance is the process of removing land mines/Improvised Explosive Devices (IED) from an area. In military operations, the object is to clear a path through a minefield rapidly, and this is often done with devices such as mine ploughs and blast waves. Specially trained dogs are also used to narrow down the search and verify that an area is cleared. Other systems for mine detonation include mechanical mine-clearing systems such as flails and excavators and mine rollers. The mechanical mine-clearing system such as mine roller could be manned and remote control systems. Mine rollers may be attached to a vehicle such as a battle tank, armoured vehicle or personnel carrier, vehicle, or the like. The vehicle may push or pull the rollers over the terrain, and the pressure from the roller contacting the ground detonates the mine or improvised explosive device (IED) placed in the terrain.

Major General Rogers Nicholas, a one-time Theatre Commander in Operation Lafiya Dole, identified the lack of Counter Improvised Explosive Devices (IEDs) equipment as one of the major impediments to the ongoing counter-terrorism and counter-insurgency operations against Boko Haram terrorists in the North-east. He made the statement when the participants of the Course 2, Army War College paid him a courtesy visit in Maiduguri. Additionally, the Chief of Defence Staff (CDS), General Abayomi Olonisakin while fielding questions from journalists at the Military Command and Control Centre

---

<sup>23</sup> Imam, A.S. and Abdullahi, A., Development and Evaluation of a 2KVA Fuel-less Generator for Field Use, 2020.

(MCCC), Maiduguri, disclosed that the major challenges being encountered by the troops in the area were landmines and the Improvised Explosive Devices (IEDs) deployed by Boko Haram, adding that the problems were being sorted out with a combination of creative techniques and landmine resistant equipment. In response to the challenge of lack of Counter Improvised Explosive Devices (IEDs) equipment, again, General Buratai provided funding to CED and its collaborators to embark in R&D aimed at to manufacture indigenous mine rollers for the Nigerian Army. These were manufactured and tested at the battle fronts in the have been deployed to Operation Lafiya Theatre.



### **Design and prototyping of a Multi-Mission Tactical Unmanned Ground Vehicle**

The growing activities of insurgents in Africa and the challenges associated with combating insurgency is enormous on government and the troops. The idea of developing the Eagle-Bot emanates from the growing demand for employing technology to fight insurgency. The nature of the insurgent's practice and terrain demand that we look inward towards developing homegrown solutions to our technological needs as it is clear that the industrialized nations are unwilling to accept our military hardware procurement request. The Eagle-Bot was developed through a collaborative R&D effort between the Nigerian Defence Academy (NDA), and Command Engineering Depot (CED) envisaged to revolutionize the approach of combating insurgency in Nigeria.

The equipment is intended to perform a variety of tasks in a complex urban environment incorporates the following features:

- a. It is a remotely operated mini tactical Unmanned Ground Vehicle (UGV)
- b. It is based on 8×8 all-wheel-drive chassis, with the 8 wheels having in depended suspension to deliver high mobility on cross-country terrains.
- c. The vehicle is powered by eight high-torque electric motors and can attain a maximum speed of 38km/h and travel to a distance of up to 20km.
- d. It has a length of 2 m, a width of 1.15 m, a height of 0.85 m, and is capable of carrying 2 injured soldiers or payloads weighing up to 350kg.
- e. The vehicle is remotely operated from the command and control station, which comprises a laptop with a user control panel.
- f. It is fitted with an optical camera at the rear top to provide a 360° unobstructed view for the operator.
- g. The operator transmits commands such as guidance, navigation, obstacle avoidance and control to the vehicle through a secure radio link within a distance of 10km.
- h. It also features two wide-screen monitors are located in the control station to display the vehicle's movement and video telemetry to the operator.
- i. Additionally, the vehicle is armed with a single 12.7mm x 108mm heavy machine gun fitted to a roof-mounted, remote-controlled turret.



### References

- Interview with Lieutenant Colonel AS Imam, 46 years, Nigerian Army Engineering personnel, Department of Mechatronic Engineering Nigerian Defence Academy, Kaduna, 21<sup>st</sup> November, 2021
- Capt SS Ogundele, NAPH 01 Lead Researcher, an Interview, 7 July 2021.
- Maj Gen SS Araoye, Commander CED, an Interview on 8 July, 2021.
- Maj Gen VA Ezugwu, CED MD/CEO, Remarks at the Launching of the LPV in Kaduna, February 5, 2019.
- Sam, O.G.A. 'The Involvement of the Army Engineers in National Development', Institute Paper, National Institute of Policy and Strategic Studies, 1993
- Test Flight and Development Center Saaf, ISBN: 6200802610
- Nigerian Army Education Corps and School (NAECS), *History of the Nigerian Army*, Abuja: NAECS, 1992.
- Obasanjo, O. *My Command*, Ibadan: Heinemann, 1987.
- Godwin, A.I. *The Tragedy of Victory: On-the-Spot Account of the Nigeria-Biafra War in the Atlantic Theatre*, Ibadan: Spectrum Books Limited, 2013.
- Perouse-de-Montclos, M. ed. (2014), *Boko Haram: Islamism, Politics, Security and the State in Nigeria*, Ipskamp Drukkers, Netherlands
- Top 10 Military Light Utility Vehicles – Military Today.com". Archived from the original on 2018-06-03. Retrieved 2018-06-18.
- Lt Gen TY Buratai, COAS, Speech at the Launching of LPV in Kaduna, 5 February, 2019.  
<https://zarconian.fandom.com/wiki/Helicopters>. <https://zarconian.fandom.com/wiki/Helicopters>.
- Burke, S. The Pentagon's Fuel Fiefdom (2017) New America resource-security/natural-security/pentagons-fuel-fiefdom/ Google Scholar.
- Birkler, J.B. Garfinkle, K.E. Marks, Development and Production Cost Estimating Relationships for Aircraft Turbine Engines, RAND Corporation, Santa Monica, CA (1982).
- Imam, A.S. and Abdullahi, A., Development and Evaluation of a 2KVA Fuel-less Generator for Field Use, 2020.
- Dada, J.P. *The Federal Armed Forces in the Nigerian Civil War 1967-1970*, Jos: Midland Press, 2000.
- Dule, S.M. Nigerian Army Education Corps and School (NAECS), *History of the Nigerian Army*, Abuja: Nigerian Army Headquarters, 1994.
- Nigerian Army Education Corps and School (NAECS), *History of the Nigerian Army*, Abuja: NAECS, 1992.
- Obasanjo, O. *My Command*, Ibadan: Heinemann, 1987.