Journal of Innovative Research in Engineering and Sciences 2(6), December, 2011.
ISSN: 2141-8225. http://www.grpjournal.org/Journal/Category/JOIRES.aspx.

A comparative Study on the Design and Characteristic Performances of DICON made Guns in Nigeria *(pp.380-387)*

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Abstract: This paper provides insights into the designs and characteristic performances of different types of guns made by the Defence Industries Corporation of Nigeria (DICON), through comparative analysis of their data facts as obtained from surveys at the company with corresponding similar gun types designed and produced by reputable manufacturers in other nations of the world. Generally, the guns produced by the corporation have been found to be of high and comparable performance capabilities with the best similar types elsewhere in the world, inspite of design variations between them.

Key words: Defence and security, gun, design, performance, levels, DICON.

INTRODUCTION

Developments in technologies of weapon production and usage are particularly important for the internal and external defence security of any nation. In Nigeria, the use of military weapons on a meaningful scale has been relatively recent. It was only during the country's civil war of 1967 to 1970 that widespread knowledge and use of guns for defence and other purposes attained a high scale. Before the war all guns were imported apart from the local hunting guns widely known as "Igwe" which were produced locally. Throughout history, advances in weapon designs have rarely remained the province of any one nation. For example the design characteristics of some weapons produced by some countries are copied and refined by others. In Nigeria, industrial production of weapons is still something new. The 47 year old Defence Industries Corporation of Nigeria (DICON) under license from Fabrique Nationale D'Acrnes de Guerra, Belgium is the sole legal industrial producer of guns in Nigeria. Surveys conducted by Mbaka (1995) shows that there is also unlicensed secret local production of guns of both engineering and non-engineering designs in most parts of Nigeria with the main area in some places of Eastern Nigeria like Aba, Awka and Onitsha. This is the region of Biafra republic of the civil war years which was known to produce the model 12 Berretta submachine gun which gun designers at DICON have modernised today to the 9mm model submachine gun.

The desired performance of any gun for a given target depends on its barrel design, component parts, material makes, and mechanisms with due consideration to factors affecting them. The aim of every gun designer is to design guns that will perform consistently accurately over a long time and also have the highest attainable single short kill probability over a given range whilst keeping the cost of production minimal. In selecting the best gun for a given task, the relative performance of the weight, operation, range, accuracy, and mobility, e.t.c of the projectile will often vary and even conflict. These conflicting requirements can never be fully satisfied in any given gun. Consequently modern armies are equipped with families of guns to fulfil different tasks. Equally the individual guns themselves often mirror the need to reach compromises in their desired characteristic performances (Owens, 1979; Janes Information, 1985; Akehurst, 1989). At DICON batch production of guns in classes ranging from that of the pistol to the machinegun are produced to meet mainly military, police and other para-military requirements. The prime objective of this paper is to provide information on the level attained in the DICON gun types designs and their performance capabilities for possible areas of improvement.

METHODOLOGY

Survey of each gun type produced by DICON was conducted by Mbaka (1995) at the company. Relevant information on each type, such as material makes, design specifications, operation mechanism, calibre and performance were collected and analysed viz-a-viz relevant ones on corresponding similar gun types of high reputation from other countries of the world.

RESULTS AND ANALYSIS

Some collected relevant information on each gun type produced by DICON are juxtaposed with those of some foreign types and shown in tables 1 to 4 for better appreciation of their differences and similarities.

Table 1: The Design specifications and performances of the Italian and Spanish type made pistols compared to the 9mm HP DICON type. (Mcgraw Hill Encyclopedia, 1989; Mbaka, 1995)

Country	Nigeria	Italy	Spain
Gun	9mm High Power FN Pistol	9mm D.A Berretta Pistol	9mm D-A Star pistol
Operation	Short recoil	Short recoil	Short recoil
Calibre	9mm Parabellum	9mm Parabellum	9mm Parabellum
Feed	13 – rounds	15 – rounds	15 – rounds
Overall weight	1.040kg	1.280kg	1.14kg
Pistol Length	200mm	217mm	205mm

Barrel length	115mm	125mm	120mm
Rifling	6: turn in 280mm	6:1 turn in 280mm	6 grooves
Muzzle velocity	380m/s	390m/s	380m/s
Rate of fire	40 round/min	40 round/min	40 round/min
Effective Range	45m	50m	50m

Table 2: The Design and performance Specification of the Nigerian made SMG and some foreign made ones (Mbaka, 1995; Labbert, 1990)

Country	Nigeria	United Kingdom	USA
Gun	9mm model 12 SMG	9mm L2A3 Sterling SMG	9mm MP – 3 Interdynamic SMG
Operation	Blowback, Selective	Blowback	Blowback
Calibre	9mm	9mm	9mm
Feed	20, 32, 40 box	34 box magazine	36, 50 box magazine
Overall weight	4.18kg	4.31kg	3.6kg
Gun length	418mm	483mm	317mm
Barrel length	200mm	198mm	180mm
Rifling	6 grooves rh	6 grooves, 1 in 280mm	6 grooves 1 in 400mm
Muzzle velocity	381m/s	390m/s	380m/s
Rate of fire (cyclic)	550 round/min	500 round/min	700 round/min
Effective Range	200m	200m	200m

Table 3: Design and performance specifications of the 7.62mm FN LAR DICON and some foreign made rifles (Akehurst 1989; Mbaka, 1995)

Country	Nigeria	Former USSR	USA
Gun	7.2mm FN LAR rifle	7.2mm AK-47 rifle	MI6A2 Assault rifle
Operation	Gas	Gas	Gas
Calibre	7.62mm x 51mm	7.62mm x 39mm	5.56mm x 45mm
Feed	20 round box	30 round box	20-30 round box
Overall weight	3.75kg	3.15kg	3.1kg
Method of locking	Sliding bolt	Rotating bolt	Rotating bolt
Gun Length	-	462mm	442mm
Barrel length	533mm	414mm	508mm
Sights distance	-	-	501mm

(max)			
Rifling	4 grooves	6 grooves rh	6 grooves 1 in 305mm
Muzzle velocity	840m/s	715m/s	1000m/s
Effective Range (cyclic)	650-780 rd/min	600 round/min	700-980 rd/min
Rate of fire	650m	400m	400m – 600m

Table 4: The Design and performance specification of Nigerian made shotgun and some foreign made shotguns. (Akehurst 1989; Mbaka, 1995)

Country	Nigeria	USA	Italy
Gun	DICON-Type single Barrel	37m Itachaca shotgun	Franchi Riot shotgun
Operation	Slide	Slide action repeater	Hand pump gas
Calibre	12-guage	12-guage x 2¾ in	12-guage
Feed	2 rounds	5 rounds	3 rounds
Locking	Break lever locking	Slide	Slide
Weight	3.01kg	3.06kg	2.95kg
Length	1070mm	-	970mm
Barrel	706mm x 30mm	608mm	570mm
Chamber	80mm	-	-
Choke	Cylinder	608mm full choke	Rifled slug
Sights	Metal bead front	-	-
Effective Range	Not specified	Not specified	Not specified

The DICON High power pistol is made of light alloy carbon steel with its furnishing of reinforced plastic. The Italian Berretta and Spanish Star pistols are made of alloy steel with their grips, hammer lever, and cocking lever of reinforced fibre. The DICON made pistol is controlled by slopping locking lugs, and breech width. Its grip is round and smaller than that of the Star pistol. The Berretta mechanism consists of lugs and recesses with a safety mounted on its slide to provide a de-cocking facility. The Star pistol consists of cams, and locking lugs on its barrel chute; and the barrel muzzle end the barrel choke and is conical in shape. The High power pistol has an adjustable rear sight, and its hammer has a notch which reduces the effect of recoil when its breechblock moves backwards. The High power pistol is reliable and of easier handling than others, though its effective range is not up to that of other pistols. This is attributed to its shorter barrel length, and material make. Its muzzle velocity is also handicapped by its barrel length and it has the least feed advantage

as can be seen from table 1. The High power pistol however, has better accuracy and consistency than the other two types of pistols, due to its smaller overall weight, which reduces its recoils. The Beretta is also reliable, but it has higher muzzle velocity and weight than other pistols, thereby affecting its accuracy due to high recoil. The Star pistol is reliable and has the same muzzle velocity as the High power pistol. Its effective range is also of the same order with the High power pistol but more effective because of some differences in material makes. The sight of a Star pistol is adjustable and this can reduce its sight errors and enhance its accuracy.

The Nigerian model 12 SMG DICON is made from forged carbon steel. Its barrel and receiver, fore part, internal parts are from alloy steel, and furnishings from reinforced plastics. The United Kingdom's Sterling SMG is also of forged carbon steel. The internal parts of the gun are of light carbon alloys with the trigger, trigger guard of pure steel, and furnishings of light removable plastics. The American Inter-dynamic SMG is of carbon steel. Its internal parts are of light carbon alloys and furnishings of high impact strength plastic which also frames the upper part of its receiver. The mechanism of the DICON SMG consists of a receiver, compensator and springs. The model 12 DICON SMG has two grips, which together with the receiver and magazine housing are all one unit. Its breech is cylindrical with a horizontal groove and wrap-round breechblock type that envelopes the barrel. Its front sights are adjustable for elevation and windage (Mbaka, 1995; Janes Information Group 1985). The Sterling SMG consists of spindle, disconnector, sear, recesses, and springs. Its bolt is of the reciprocating type. The sear notch on the bolt is in front while the safety notch is at the rear of the bolt. This makes the Sterling gun to have only one safety unlike the case of the model 12 DICON which has an additional trigger safety in front of the trigger guard. The American Interdynamic SMG mechanism also consists of recesses, sears, and a gas port which regulates and aids its working mechanism. It has two safeties, the safety slot and a second safety incorporated into the bolt guards. The Nigerian SMG is quite reliable and its accuracy is high compared to most guns in this class. Although it is lacking in performance when compared with the American Interdynamic SMG, its accuracy is higher than that of the Interdynamic. The effective range for most known SMG is 200 metres; the Nigerian model however has higher accuracy because it has a better sight arrangement and radius. The Interdynamic SMG is compact, light and has an excellent barrel pressure rifling one turn in 400 mm, which makes it to meet the 200 metres killing range. It is smaller, and has an edge over other SMG in weight and handling but the recoil makes it difficult to handle during firing. The Sterling SMG falls behind but has a very high reliability and accuracy. It manages its heating problems well but due to the position of the magazine slot, handling it is a bit difficult.

The DICON FN LAR rifle is made entirely from 0.3%carbon steel with its hand guard, pistol grip and stock of reinforced plastic. Its butt is of elastic rubber. The American M16A2 rifle is of light carbon alloys with the forepart of the barrel reinforced with mild carbon steel. Its furnishings are of high compact reinforced rubber, while the Soviet AK-47 rifle is made from 0.25% carbon steel. The furnishings of its handguard, pistol grip and stock butt are all of wood, while its receiver and slide are of carbon steel. All the guns are gas operated locking bolts, and springs are parts of their mechanism. The gas parts include the gas cylinder, and vents. The FN LAR has a long barrel with a positive locking slide. The M16A2 has a flash suppressor, round handguard and is of straight line construction. The handguard is cylindrical in shape and is covered with an improved heat deflector. The sights of AK-47 rifle are adjustable both laterally and horizontally with the foresight having a flip operative. It also has a muzzle compensator which reduces the muzzle climb and its handguard can be easily dismantled and external cooling aids attached. The American M16A2 gets its name from its extremely good accuracy and easy handling under all conditions. It is light, compact and the easiest advance assault rifle to handle. Its reliability is however questionable due to its tightness of twist in barrel rifling. The M16A2 resist muzzle climb because of its flash suppressor and this eliminates downward blast completely, while its movable sights can be used to enhance accuracy, hit probability and sight error alignments. Its handguard is round with maximal ventilation, and an improved heat deflector to avoid heat transfer. The FN LAR is a proven reliable and high power rifle. Its long barrel with reinforced muzzle makes it have a high barrel pressure. The FN LAR and AK-47 are not of straight line construction; therefore their accuracies are not as high as M16A2 rifle. This is because the high muzzle climb and recoil make these guns more difficult to handle than the M16A2 rifle. The AK-47 rifle is compact, robust, reliable and capable of producing remarkably consistent grouping and accuracy compared to other short-barreled guns. The AK-47 is handicapped in terms of range despite its robustness; while the range of the FN LAR is quite remarkable inspite of its smaller weight.

The Nigerian DICON type single barrel shot gun is of pure carbon steel. Its furnishings are of walnut wood, although most of its screws and springs are of light alloy steel. The American Itchaca shot gun is made from wood with its barrel from carbon steel and the butt from elastic rubber. The Italian Franchi riot shot gun is made from carbon steel but all its furnishings are of plastic. The Nigerian DICON type shot gun is a single barreled with a two round capacity. It has a break lever locking and three safeties. The barrel is quite long and cylindrically choked. The sights are fixed, a U-notch as rear sight and a blade as front sight. The American Itchaca shot gun is double barreled shot gun with 5 round capacity. Its working parts move like those of advanced guns thereby allowing the slide-action to be positively perfect. It has two safeties with fixed sights. The Italian Franchi shotgun is single

barreled with a feed capacity of 3 rounds. It has two safeties and rifled with slug untypical for a shotgun. Its mechanism is hand-pumped with the aid of trapped compressed gas. Performance of the shotgun can be hardly analysed due to the scattering effect of the gauge cartridge and for this reason the effective ranges of shot guns are unknown, but it is very lethal at a very short range. The DICON single barrel shotgun when choked can have a high lethality up to 20 metres. It has a high recoil like other shotguns and a low feed. Its accuracy cannot be analysed at long range, but its consistency is average at low ranges. Its weight is quite manageable at 3 kg but its long barrel makes handling uneasy. It is very reliable. The American Itchaca shotgun has more muzzle velocity than the other shot guns because of its short barrels. It has more feed and slide action makes its hit probability very high. It is more effective than others, but has a high degree of recoil, thereby making its accuracy low. Its consistency is low but it is a reliable gun. The Italian Franchi shotgun is like an advanced shotgun but its reliability is still in doubt. It is a single barrel shotgun with a low feed and it is rifled instead of being choked. This coupled with the rifle-like mechanism makes the shotgun have a good muzzle velocity and recoil although the length of the barrel affects this also.

CONCLUSION AND RECOMMENDATION

Design and performance ratings of guns produced by DICON have been compared to other ones of high reputation produced in other countries, and found to have comparable performances inspite of design variation between them. The design of any gun and its performance may not be optimum; this means there is still need for improvement on the designs of the guns to achieve better performances and handling. The information presented in this paper is hereby recommended to be exploited by the management of DICON, any other gun producer, researchers and the general public for possible areas of improvement towards optimal designs performances of the guns as well as other ones elsewhere.

REFERENCES

Akehurst, R. (1989). *World of Guns*, Macmillan Press Second Edition, U.K.

Encyclopedia Britannica (1768) William Benton Publisher Volume 18, Chicago, US.

Janes Information Group (1985). *Janes Infantry Weapons*. 1985 - 86 Edition. Janes Publisher Inc. Boston, USA.

Labbert, P. (1990) *Military Small Arms Ammunition of the World*, Janes Publishers Inc U.S.A.

Mbaka, G.A. (1995). Effects of Design Variations on the Performance of Locally Made Guns in Nigeria- A Case Study of DICON, B.Eng Research Project Report Unpublished, Department of Mechanical Engineering, Nigerian Defence Academy, Kaduna, Nigeria.

Mc-Graw Hill (1989). *Concise Encyclopedia on Small Arms.* Third Edition William Benton Publisher, Chicago.

Owen, J. (1979). *Brassey's Infantry Weapons of The World*. Brassey's Publishers Limited, U.K.