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**FORENSIC SCIENCE**
**PAPER No. 6 : Forensic Ballistics**
**MODULE No.4: Smooth Bore Firearms and Improvised Weapons**

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## 1. Learning Outcomes

After studying this module, you shall be able to know,

- About Smooth Bore Firearms and their classification
- Mechanism of Smooth Bore Firearms
- About Bore and Choke
- Concept of Improvised Firearms

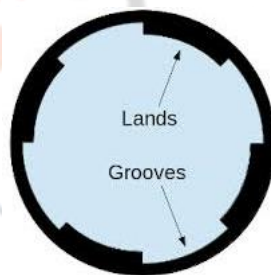
## 2. Introduction to Smooth Bore Firearm

Generally, a Firearm is a device so designed that may propel a projectile with abundant force. The required 'force' is generally produced by creation and expansion of gases produced by the burning of powder charges (i.e., Propellants) inside the cartridge. So far, Air Guns (Rifles or Pistols) are concerned, the said necessary force is provided either by Compressed Air or gases like Carbon Dioxide or Nitrogen.

A firearm is called so because it is this flame which is responsible for the burning of propellant to create sufficient gas to drive the projectile.

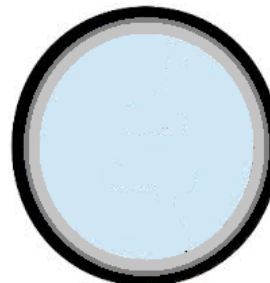
Firearms are broadly divided into two types, according to their internal design of the barrel, which are:

### (1) Rifled Firearms



*Rifled Firearm: Rifling present*

### (2) Smooth Bore Firearms

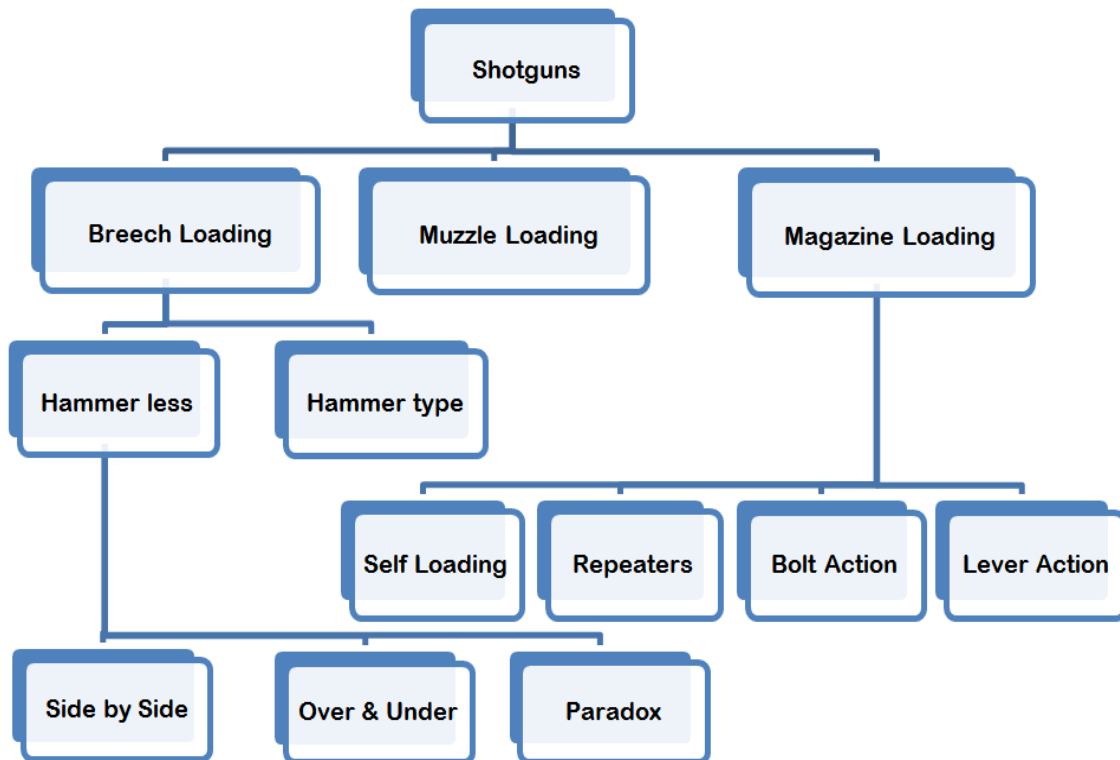


*Smooth Bore Firearm: Rifling absent*

Smooth Bore Firearm is the one in which, the Bore (discussed later), or inside of the barrel, is perfectly smooth from Breech end to the Muzzle end. For illustration, if the barrel of a shotgun is cut up cross-sectionally, it will be a perfect ring.

Examples of Smooth Bore firearms are Shotguns and Muskets.

### 3. Classification of Shotguns



**Shotguns are mainly of three types:**

### **1. Breech Loading Shotguns**

The Breech loading shotguns are further divided into two sub- types; one contains an outer hammer to knock the cartridge and known as ‘Hammer’ type while in the other type the hammer mechanism is placed entirely within the gun. The Breech loading smooth bore firearms are in vogue at present and their good examples are:

- a. SBBL -** It is Single Barrel Breech Loading shotgun which has a single barrel making it capable to house only one cartridge at a time to its chamber present at the Breech end.
- b. DBBL -** It is Double Barrel Breech Loading shotgun which has two barrels and is capable to stock not more than two cartridges at a time.

Shotguns having ‘Hammerless’ mechanism are further divided into three types:

- i. Side By Side type:** It is a typical DBBL and the two barrels are attached in a manner that they are adjacent to each other.
- ii. Over and under type:** It is also an example of DBBL in which the barrels are one above the other.
- iii. Paradox Guns:** This gun has uniqueness as the barrel is partially rifled. Small portion at the muzzle end is rifled but the major portion of the barrel is smooth. The rifling is done in order to provide gyroscopic stability to the projectiles which are generally Slugs or Ball ammunitions.

### **2. Muzzle Loading Shotguns**

The Muzzle loading shotguns are obsolete nowadays because of its primordial mechanism in which the Gun powder was rammed into the barrel through the muzzle end and then single ball ammo placed above the charge. The escape of gases made the weapon dangerous and prone to accidents. Moreover, the range was not as much as expected and making their lethality less.

### **3. Magazine Loading Shotguns**

There are some drawbacks in the shotguns; one of them is the loading capacity of a shotgun. Usually, the numbers of cartridges available in the gun are not more than the maximum number of the barrel. For repeated firing shotguns surely lacks quality.

To overcome the problem, various innovations were introduced and positive results were obtained at some extent.

Based on the modifications, magazine loading shotguns are of following types: (i) Self-Loading, (ii) Repeaters, (iii) Bolt Action and (iv) Lever Action

#### 4. Mechanism of Shotgun

A Shotgun has a most simple mechanism which contains very basic but important parts which are:

##### 1. Barrel:

Barrel of a firearm is one of the most important parts which facilitate the movement of the projectile. It also provides a space for the expansion of gases. The barrel of Shotguns are smooth bored, i.e., no rifling.

##### 2. Chamber:

Chamber is present at the Breech end of the firearm where the cartridge is housed. The cartridge rests in the chamber and trapped by its 'Rim'.

##### 3. Bore:

It is the number indicating the size of the internal cross sectional diameter of the barrel, i.e., the number of spherical lead balls exactly fitting inside the barrel and together weighing exactly 1 pound.

##### 4. Choke:

It is a depression at the muzzle end of the shotgun produced in order to decrease splattering of pellets and increase their range.

##### 5. Action:

Action of any firearm consists of mechanism for loading of cartridge, firing, extraction and ejection.

## 6. Stock:

Stock of a firearm is a part which support and hold the internal parts in position.

## 7. Firing Pin:

It is pin like structure which hits the percussion cap of the cartridge case when the trigger is pulled.

## 5. Bore

Bore is the number indicating the number of spherical lead balls fitting inside the barrel and are together weighing 1 pound. For example, a 12 Bore gun is a weapon in which 12 spherical lead balls of same dimensions exactly fits inside the barrel and together they weigh up 1 pound.

Shotguns have different bore diameters, the number prefixed before the bore represents the bore size. For greater number of the bore, the size of the bore becomes lesser. In case of a 12 bore shotgun, the internal diameter of the barrel is equal to the diameter of a spherical ball of pure of lead weighing one twelfth (1/12) of a pound (454 gram). Similarly, the corresponding lead ball weighs one sixteenth (1/16) pound to the case of a 16 bore shotgun. It is quite clear that less weight means less material and hence less diameter of the shotgun.

The bore diameter can be found from the given bore number using the well-known formula:

$$d^3 = 4.6578/N$$

Where,

**d** is diameter of the barrel in inches

**N** is the bore number

Bore diameters of various bore number:

<b>Bore Number</b>	6	8	10	12	16	20	24	28	32
<b>Diameter in Inches</b>	0.919	0.885	0.775	0.729	0.637	0.615	0.579	0.550	0.526

When the diameter of a smooth bore firearm barrel is less than half an inch, the bore diameter is designated in decimal fraction of an “inch”, e.g. Musket is a smooth bore firearm and its bore is represented in the decimal fraction as .410 inches.

## 6. Choke

Barrels of shotguns are often narrowed down to reduce the diameter of the barrel near the muzzle end. The purpose of narrowing down is to control the dispersal of the shot charge so that the effective range gets increased. This contraction is known as **Choke**.

The choke tapers inside the barrel to a distance varying from 3 to 15 centimetre from the muzzle end. The reduction of the bore diameter (constriction) varies from about 1 to 0.25 millimetres approximately in 12 bore shotguns. When the reduction is one millimetre reduction it is **Half Choke** and with 0.25 millimetres it is **Quarter Choke**. If the constrictions are less than 0.25 millimetres then it is an **Improvised Cylinder Barrel**.

Although there are several different types of chokes namely Cone choke, Jug choke, Variable choke, Reverse choke and Standard choke.

## 7. Improvised Firearms

Improvised firearms are also known as Home-made firearms as they are manufactured by local blacksmiths or illegal manufacturers from easily available household materials. These materials may be iron pipes, car steering’s pipes, and hose pipes, etc. with crude tools for the firing mechanism.

The calibre, shape and size of the firearm depend upon the availability of the ammunition, barrel tube and the skill of the blacksmith. There are large variations in the mechanism in the functioning of the firearms and it varies not only from the standards but also from one firearm to another.



They are effective at short range only as the combustion of propellants is often incomplete and the extent of combustion varies from shot to shot. The wounding effect of the improvised firearm is nearly unpredictable. Because of the easy and inexpensive availability these weapons are favourite choice for the criminals.

The ammunitions popularly used in the improvised guns are of 12 bore Shotgun cartridge, .315, .303 ammunitions.

Some examples of improvised firearms are commonly known as Zip Guns, *Katta*, *Addhi*, etc.

## 8. Summary

- ❖ Smooth bore firearms are popular because of their easy maintenance, simple mechanism and sturdy nature.
- ❖ Unfortunately, Smooth bore weapons are manufactured illegally on a small scale, as well as on commercial scale for the criminal activity.
- ❖ Each such non-standard firearm is unique in itself in respect of mechanism of firing and make up and known as Improvised Firearm.
- ❖ When the cartridge is loaded from the muzzle end, the gun is called muzzle loading type. In such a gun, the cartridge components which are loose are inserted from the muzzle end. A ramrod attached to the gun is used to position various components.
- ❖ The stock of firearms holds the other parts in position and provides support. In automatic and semi-automatic pistol, the stock also carries the magazine.