

Bullet Comparison:

Bullets are the projectile pieces of cartridges consisting of lead core hardened with tin, Antimony and surrounded in an envelope of hard metal. Bullets generally fragment or mushroom up upon impact depending on their hardness.

The bullet receives marks from the barrel, the lands of the barrel engrave grooves on the bullet. The grooves of the barrel may also scrape the surface of bullet. The muzzle also gets burnt due to crowning, due to accidental ~~data~~ damage. It is important to note:

- The distance or rust on the bullets or in the barrel affect the clarity of the marks.
- The barrel engraves the marks on the lead bullets easily. The marks are mutilated or destroyed with equal ease.
- The bullets passing through the intermediate target may carry scratches on the edges.
- The bullets fired from revolver sometime carries Slippage marks. This happens because the projectile has to jump the gap in distance between the barrel.

The chamber and the barrel bore are not perfectly aligned in the process some parts of the bullet are shabbled or scratched by the edges of the barrel at the breech end. These marks may interfere with the identification of firearm which has fired the projectile and sometimes proved to be useful in the identification of firearm.

Principle of Arm Ammunition Linkage:

When a firearm is discharged the cartridge case comes in contact with firing pin, breech face of the barrel, the extractor, the ejector and the chamber of the barrel. All these parts of firearm are made up of steel during their manufacture. They undergo processes

like cutting, hammering, grinding, filing and polishing. The surface profiles of the tools used continue to change the wear and tear as the tools work on steel. Consequently all the firearms even the two barrel of same firearm show complete individuality.

The peculiarities of various parts of firearms are enhanced with the use of firearms due to wear and tear and accidental damage. When a cartridge is fired, a negative profile of the surface of firearm is imprinted on the fired cartridge case. The profile pattern is called thumb print of the firearm. It permits individualisation of firearm.

The cartridge cases and bullets are made of softer materials than the steel of firearm. The marks producing surfaces therefore do not change for long time with continued use. The firearm can be identified in respect of the fired ammunition even when the firearm is recovered after long time. The interval between the commission of crime and recovery of firearm is too small to allow extensive changes in the barrel.

NOTE → If the firearm is intentionally tampered to change the profile pattern of the surface then, the fired ammunition may or may not be identified.

Class and Individual Characteristics:
The position, size and general shape of firing pin, the breech face, extractor marks, ejector, the chamber marks on the cartridge case are the class characteristics of firearm. The final details of all these marks (wear and tear) constitute individual characteristics.

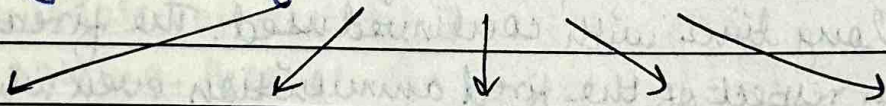
In the firing bullet, calibre (constriction at the muzzle point so as the bullet leaves with higher velocity). Number, width,

depth, direction and twist of grooves and lands form the class characteristics.

- The final details or striations (scratch marks produced in the gun when bullet is fired) in lands and grooves are individual characteristics.
- The firearms of same make and model imprint common class characteristics on the fired ammunition. The firearms of different make and different models imprint different class characteristics.
- The individual features are always different. No two firearms have same individual characteristics.

Basis of fired Cartridge:

The cartridges when fired come in close contact with -


Firing pin breach face extractor ejector chamber
of the firearm. The paths imprint negative fascinate on the cartridge case.

① Firing pin: It strikes the cartridge on the percussion cap (where bullet strikes) and imprints the mark. The impacts explodes the cap composition. the flame and the heat produced rapidly converts propellant charge into gases. The high pressure developed presses the case against the firing pin. the clarity of firing pin mark is thus enhanced.

② Breach face: The surface of the action block surrounding the firing pin is called breach face. the gases push the cartridge case violently against the breach face, which imprints an negative profile on the cartridge base. The breach face profile is highly characteristics.

NOTE → • Breech face marks are often absent on the cartridges fired from shot gun.

• The ammunition fired from improvised firearms frequently carry breechmarks from the weapon which usually alone are sufficient for identification of weapon.

① Extractor marks: Like chamber marks are prominent, they may permit identification of firearm when imprinted clearly. Extractor marks help in fixing the orientation of cartridge in the chamber.

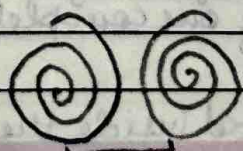
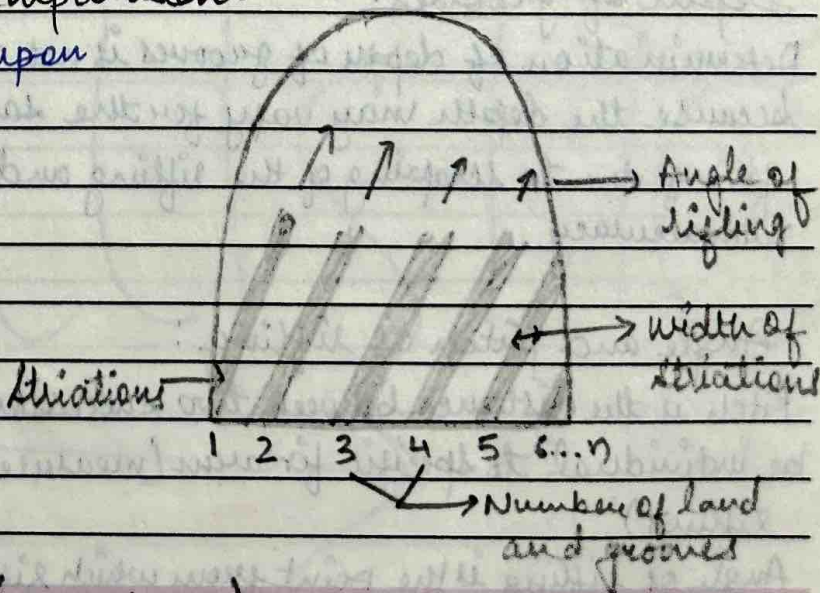
② Ejector marks: In automatic and semiautomatic firearms the ejector marks are the marks which are imprinted when the cartridge case is ejected outside so positioned that the fired shell after striking the device is pushed out of firearm. These marks are useful as class characteristics to fix or eliminate the make of firearm.

③ Chamber marks: These are observed rarely on fired ammunition. Ordinarily some defects or some deposits in the chamber imprints, its negative profile on the cartridge case when it develops pressure on firing.

Methods of Bullet Comparison:

Bullet examination is based upon

- Direction of rifling
- Number of lands and grooves
- Width of grooves
- Depth of grooves
- Angle and pitch of rifling
- Individual striation marks



twists (direction)

Direction of Rifling:

Rifling marks may be right handed or clockwise twist or left handed or anticlockwise twist, depending upon rifling inside the barrel.

Number of lands and grooves:

This will give an idea of make up and model of the firearm which a manufacturer used to create rifling in particular firearm. They can be easily counted visually or under low magnification stereomicroscope.

- Limitation:
- If the barrel is so short to produce a complete twist of rifling on the bullet then the rifling marks will not be completely imprinted.
 - If the firearm is not in proper functioning condition due to regular servicing of barrel then the rifling may be scrap down and will not be completely imprinted.

Width of lands and grooves:

Grooves and lands on the bullet are the replicas of the lands and grooves on the barrel. It is customary to measure width of groove at its bottom. It can be measured with the help of screw gauge or vernier calliper.

Depth of grooves:

Determination of depth of grooves is not a reliable measurement because the depth may vary for the same firearm after certain firing due to scraping of the rifling and also it cannot be measured with accuracy.

Angle and pitch of rifling:

Pitch is the distance between two successive curves of rifling which will be individual to specific firearm (measurement of one complete rifling)

Angle of rifling is the point from which rifling started inside the barrel.