13055 Bullet Striations Kit

Teachers Manual

INTRODUCTION

A bullet or projectile fired from a rifled gun barrel is engraved with a mirror image of the gun's rifling. Rifling is the process of making helical grooves in the barrel of a gun or firearm, which imparts a spin to a projectile around its long axis. This spin serves to gyroscopically stabilize the projectile, improving its aerodynamic stability and accuracy.

Typically the rifled barrel contains one or more grooves that run down its length, giving it a crosssection resembling an internal gear- though it can also take the shape of a polygon, usually with rounded corners. Since the barrel is not circular in cross-section, it cannot be accurately described with a single diameter. Rifled bores may be described by the bore diameter (the diameter across the lands or high points in the rifling), or by groove diameter (the diameter across the grooves or low points in the rifling). Rifling is often described by its twist rate, which indicates the distance the bullet must travel to complete one full revolution, such as "1 turn in 10 inches" (1:10 inches), or "1 turn in 254 mm" (1:254 mm). A shorter rotational distance indicates a "faster" twist, meaning that for a given velocity the projectile will be rotating at a higher spin rate.

A bullet is the projectile launched from a firearm upon its discharge. Modern bullets are usually conically shaped and made from lead or with a lead core surrounded by a copper alloy sheath, commonly called a jacket. The bullet is swaged into the guns rifling by the explosive force of the gun powder contained within the cartridge and gun's chamber. As the bullet is forced through the gun barrel, the rifling of the barrel is imprinted on the bullet. Slight variances in the manufacture of the barrel along with the assembly of the gun's component parts will result in slight differences in the rifling marks or striations imparted on bullets fired. In effect, due to very small differences in machining and manufacture, each individual gun imparts a unique "fingerprint" on the projectiles it fires. This individuality enables forensic scientists to reliably identify or match a bullet found at a crime scene with the gun from which it was fired. It is on this "uniqueness" that the study of forensic ballistics is based.

Modern cartridges and the bullets (projectiles) they launch come in wide variety of sizes and potential force. Bullets vary in diameters of between 0.17 inches (4.4 mm) to well over 0.50" (12.7 mm). Bullet initial (muzzle) velocities vary between 600 feet per second (183 meters per second) to over 3000 feet per second (914 meters per second). In the middle of the 19th century, "self-contained" cartridges were developed, and cartridge naming or designations originated at this time. Frequently, cartridge designations refer to its bullet diameter along with its maker's name. The bullets in this kit were fired from 3 separate 45 caliber handguns. There are over 40 different types of firearms manufactured that are chambered to this cartridge.

Contents:
This kit contains four bullets that have been shot from handguns into a collecting vessel to preserve their rifling striations. Modest deformation of the bullets may be observed but this is minimal and would have no impact on the identification or "matching" of the bullet to its corresponding firearm. Two of the bullets were fired from the same firearm, while the remaining two bullets were fired from two different firearms.

Notes:
The three different firearms used have nearly identical twist rates of one turn in 16 inches. This is the standard twist rate for barrels of this caliber and is intended to provide optimal stability for bullets of this diameter and length (weight). To affirm identification the bullets have been number coded with a stamp in the base of the bullet as follows:
0 - Crime Scene
1 - Suspect 1
2 - Suspect 2
3 - Suspect 3
(NOTE: Crime Scene and Suspect 2 were shot from the same gun.)

Exact identification requires very careful observation of the rifling striations. It should be noted that the cartridges that originally contained these bullets were resting (due to gravity) in the "bottom" of the barrels chamber. As such its initial position prior to discharge was not perfectly concentric to the rifling. You may note that the bullets appear to have different contact marks around their circumference. This is partially due to the bullet's initially eccentric position at its instant of discharge. To correctly match one specimen bullet to another it is best to examine the entire circumference of each bullet in question. Key points of observation include: Width of rifling, number of lands and grooves, overall barrel diameter (indicated by observed degree of contact in the groove surfaces) depth of rifling (indicated by the amount of metal displacement) and "sharpness" of rifling edges. While it is often necessary to perform microscopic analysis for a positive "courtroom" match of bullet to firearm, the sample bullets provided in this educational kit are of sufficient difference that they should be distinguishable using a magnifying glass and careful observation.