13056 Cartridge Case Forensic Identification Kit

Teachers Manual

INTRODUCTION:

Modern cartridges come in wide variety of sizes and potential force. Around 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 cartridge cases in this kit were fired from handguns chambered to the 45 ACP (Automatic Colt Pistol) This cartridge was invented in 1904 and has been in continuous production ever since. There are over 40 different types of firearm manufactured that are chambered to this cartridge.

Cartridge cases are normally manufactured from brass, aluminum, or lacquered steel. The task of the cartridge case is to contain the ignition source (primer), the propellant (gunpowder), and the projectile (bullet), as well as to facilitate a firearms smooth cycling and function.

Modern firearms discharge their respective projectiles (function) at pressures ranging from 16,000 psi to over 60,000 psi. Most handgun cartridges function in the lower portion of this scale. The 45 ACP cartridge is normally designed to function in the 21,000 psi range. For a firearm to function reliably, its chamber (the portion of the firearm’s barrel which contains the cartridge at the moment of discharge) must be machined to be slightly larger than the cartridge itself. Upon discharge, the cartridge case expands to fill the volume of the machined chamber and, as a result of exceeding its material’s elasticity constant (K value), takes on the microscopically unique characteristics of that chamber. The effect is very similar to that of blowing up a balloon that is contained in a soda bottle or glass vessel. At the chamber’s rear face is the firearm’s breach block, which houses the firing pin and extractor. The pressure of discharge causes the relatively soft metal of the cartridge primer to displace and form the mirror image of the firing pin and the breech face in the vicinity of the firing pin hole. Due to the violent detonation of the cartridge’s propellant, the cartridge case forms to the shape and dimensions of the firearms chamber and breech face along with any tooling marks or imperfections. It is the presence
of these imperfections upon which the science of forensic identification is based.

The majority of modern handguns are of semiautomatic design. These firearms function by extracting and ejecting their spent cartridge case as part of their firing cycle. Cartridge cases found at crime scenes are usually from this ejection. Cartridges fired by revolvers are not ejected automatically and are much less likely to be found at crime scenes.

The most readily distinguishable individual characteristic or identifying marks are usually found on the cartridge primer or around the rim. In many cases, the microscopic imperfections on the firing pin are the most easily identifiable feature and provide the most positive match of gun to cartridge case. Another easily identifiable characteristic is the mark left on or near the case rim by the firearms
extractor.

For the instructional purposes of this kit, it is presumed that the student does not have ready access to a comparative microscope. The four cartridge cases provided have been fired from three different firearms: two from the same firearm, one from a firearm of similar manufacture and another from a distinctly different firearm. The firing pins and extractors of these firearms have been slightly modified to enable relatively easy identification using low power magnification such as from a magnifying glass or loupe. As an aide to the instructor, the cartridge cases have been filled with a colored resin prior to being set in their clear display blocks. The cases filled with white resin are from the same firearm, the case filled with turquois resin is from a different gun of similar manufacture and the case filled with yellow resin is from firearm of completely different manufacture. If identifying the two “matching” cases is part of a classroom exercise, it may be best to cover the lower portion of the display block with tape to conceal this identifying feature.