Laboratory Services Bureau

FIREARMS SECTION

PROVIDING THE HIGHEST QUALITY FORENSIC SCIENCE SERVICES TO THE CITY OF PHOENIX

The Firearms Section has the ability to analyze virtually all aspects of a shooting incident; however, our primary focus is on the analysis of firearms and ammunition components. The Firearms Section is made up of Forensic Scientists and a Laboratory Technician. Most of the section are members of our primary professional organization: The Association of Firearms and Toolmark Examiners (AFTE).

The **PRIMARY SERVICES** provided by the Firearms Section are:

Function test

A function test allows for the examination and documentation of the condition of a received firearm. Things like damage, trace materials, barrel length, trigger pulls, safeties, modifications, and broken/ missing parts will be observed, noted, and/or collected. If a problem is found that makes the firearm non-operational, every effort will be made to identify the cause of the problem, and if possible, correct the problem. These tasks are done using a combination of visual and microscopic techniques, using a stereozoom microscope, a variety of tools, and potentially borrowed components from the laboratory's firearm reference collection. A function test concludes with attempting to test fire the firearm in the range. Test firing not only shows the firearm can be made to fire, but also allows for the collection and retention of both bullet and cartridge case exemplars that may be needed for a comparison to scene evidence.

Test firing a 357 Magnum revolver

Gun Prediction

When projectiles or cartridge cases are recovered at a crime scene, investigators frequently want to know 'what kind of gun did this come from'? By counting the number of lands and grooves on a projectile, measuring them, and determining the direction of twist, we can use that information to generate a list of firearms that could have potentially fired that bullet. Similarly, by examining the toolmark information on a cartridge case, we can sometimes tell what type of firearm that it was fired in.

Serial number restoration

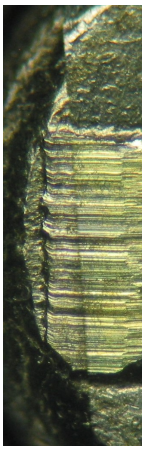
In an attempt to hide the origins of a firearm, it is not uncommon to encounter firearms with obliterated serial numbers. We have several techniques, both chemical and physical, that can be used to try to restore or recover the lost serial number.

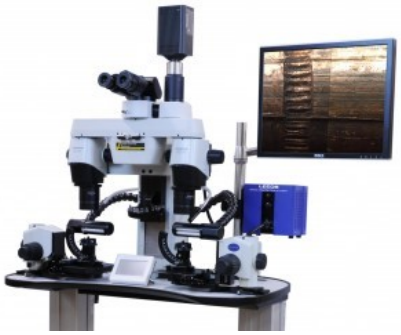
Defaced Serial Number

Restored Serial Number

Comparisons

Another common question from a crime scene is 'was this recovered projectile or cartridge case fired from, or in, a recovered firearm'? Using a light comparison microscope, the impressions or striations left on the evidence (either bullets or cartridge cases) can be compared to test fires produced from recovered weapons. In cases where no gun has been recovered, we can also inter-compare bullets or cartridge cases found at a crime scene to attempt to determine if the source of the toolmarks is the same firearm or multiple firearms.





LCM and cartridge case comparison

Toolmarks

A toolmark is any mark left by a harder object (the tool) on a softer object. By this definition, the firearms comparisons discussed above are simply a specific subset of toolmark examinations where the various surfaces or components of the firearm (the tool) come in contact with the bullet or cartridge case. In practice though when we discuss toolmark examinations we mean tools other than firearms. This includes things like bolt cutters used to cut a lock or chain, a crowbar used to pry open a window, or a pair of pliers used to break a doorknob.

Distance Determination

Occasionally it becomes important for investigators to know how far away a shooter was from a victim. If we have the victims clothing, the firearm used in the shooting, and hopefully some ammunition left over in the magazine, we can attempt to determine an approximate distance from which the shot was fired. This is done by examination of the victims clothing for a pattern of unburnt or partly burnt smokeless gunpowder (SGP) around a bullet hole. The SGP particle pattern density and overall size is compared to that of test panels produced using the suspects firearm and a section of cloth closely mimicking the article of victims clothing with a bullet hole. A similar analysis can be conducted from photographs of SGP stippling patterns on a victims skin.

Other topics encountered less often:

- ◊ Suppressors (commercial or home-made)
- ◊ Ejection patterning
- ◊ Reconstruction
- ◊ Home-made firearms
- ◊ Firearm make/model determination from photos

AFTE Theory of Identification

...enables opinions of common origin to be made when the unique surface contours of two toolmarks are in "sufficient agreement".

"Sufficient agreement" between two toolmarks means that the agreement of individual characteristics is of a quantity and quality that the likelihood another tool could have made the mark is so remote as to be considered a practical impossibility.

Comparison Conclusions

* **Identification**—Sufficient agreement of individual characteristics were observed to determine that the toolmarks were created by the same tool.
* **Inconclusive**—Insufficient agreement or disagreement was observed to come to a definitive conclusion. Inconclusive conclusions are further broken down as:
  - ⇒ **Entirely Consistent**—Agreement of many individual characteristics were observed, but not quite enough to determine that the toolmarks were created by the same tool.
  - ⇒ **Consistent**—Agreement of some individual characteristics were observed, but not enough to determine that the toolmarks were created by the same tool.
  - ⇒ **Could not ID or Exclude**—No significant agreement or disagreement of individual characteristics was observed.
  - ⇒ **Difference Noted**—Some disagreement of individual characteristics was observed, but not enough to determine the toolmarks were created by different tools.
* **Exclusion**—Sufficient disagreement of either class or individual characteristics were observed to determine the toolmarks were created by different tools.

What can Firearms evidence tell us?

It can:

- Tell us if a firearm is capable of being discharged
- Tell us if a bullet or cartridge case was fired in/from a recovered firearm
- Tell us if bullets and/or cartridge cases were fired in/from a single or multiple firearms

It cannot:

- Tell us *who* discharged a firearm
- Tell us *when* a firearm was discharged
- Tell us *why* a firearm was discharged

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