FIREARMS & TOOLMARKS EXAMINATION

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Types of firearms

REVOLVERS

PISTOLS

RIFLES

SHOTGUNS
SA \ DA Revolver
SA \ DA Pistol
Firearm Nomenclature

- Slide
- Barrel
- Extractor
- Trigger
- Hammer
- Safety
DA Pistol
Shotguns
Pump Action
Bolt Action
Lever Action
Break Open Action
Shotgun Shootings
Different Types of Shotgun Shells
STANDARD FEDERAL BRAND 12 ga. BUCK SHOT SHELL

- Plastic O/P wad
- Cardboard wad
- Buffer
- Buckshot
THE ARRANGEMENT OF 00-BUCK in a 12 Gauge SHOTSHELL

Contact Sites with Bore
TYPICAL AMERICAN BUFFERED BUCKSHOT LOAD

- Granular plastic buffer material*
  - Polyethylene or polypropylene with brand variations in size and shape
- Over-powder (O/P) wad
- Filler wads
Shotcup and Pellets in Flight near the Muzzle

Note the position of the petals
Petal ‘Slap’ – a Close Range Phenomenon
Contact Gunshot Wounds
CARTRIDGE

• A single unit of ammunition consisting of the case, primer & propellant with one or more projectile(s) e.g., bullet, shot pellets

Two basic cartridges designs:
• Centrefire cartridges
• Rimfire cartridges
Centerfire Ammunition

- Cartridge (unfired)
- Bullet
- Gun Powder
- Cartridge Case
- Primer
Ammunition- centerfire vrs. rimfire

40 S&W Centerfire Cartridge

- Bullet Jacket
- Bullet Core
- Gunpowder
- Flash Hole
- Extractor Groove
- Primer Mixture
- Base (Headstamp)
- Cartridge Case
- Anvil

22 call. Rimfire

- Head stamp
- Rim
- Brass case
- Lead bullet
- Primer Mixture
- Smokeless powder

Illustrated by firearmsID.com

M.Murasso & L.Pilcher
Lands and Grooves (Rifling) in barrel bore
Cross-section of a rifled barrel showing the grooves and lands.
What is a Bullet?

A bullet is:-

• A solid projectile propelled by a firearm

• Is normally made of a metal (e.g. lead)

• A projectile that damages its target by imparting its kinetic energy upon impact
Effects of Rifling on a Bullet

• A bullet discharged in a rifled barrel will obtain a negative impression of this rifling on its bearing surface
• Grooves on a bullet are land impressions
• Lands on a bullet are groove impressions
• Rifling imparts Class & Individual Characteristics of Firearm onto surface of Bullet
Aspects of Rifling

• Purpose of Rifling
  - imparts a rotational spin to the bullet along its longitudinal axis
  - stabilizes its flight
  - improves its accuracy w.r.t. a target
Cartridge Discharge

1. Cartridge is loaded into chamber
Cartridge Discharge

2. Trigger is pulled
3. Firing pin strikes primer housing
4. Anvil crushes primer compound
5. Primer compound reacts violently, producing a spark
6. Spark is directed out of the flash hole, to the powder charge
Cartridge Discharge

7. Powder charge is ignited and expansion of gases occur.
8. Expansion of gases causes the walls of the cartridge case to expand.
9. The expansion of gases also causes the bullet to be forced out from the mouth of the cartridge case.
Cartridge Discharge

10. The bullet is pushed out of the mouth of the cartridge case and proceeds down the barrel
11. Cartridge case is forced rearwards from the chamber
12. Head of cartridge case is pushed towards breech face of firearm
Extractor Markings

- Markings imparted to a cartridge case by the extractor of a semi-automatic firearm
- Location of the extractor on the breech block is determined by the manufacturer
- Markings are usually found on the cartridge case’s head and not on the primer
Class Characteristics

• All class characteristics are measurable
  – Caliber
  – Number of lands and grooves
  – Width of the lands and grooves
  – Direction of twist
Examination Process

Level 1 analysis - *Class Characteristics*

- Elimination, but not individualization, can occur here
Bullet Comparison

• Agreement of class characteristics
• Agreement of individual characteristics
SOME DEPARTMENTS CHOOSE TO DO THEIR OWN TEST FIRES AND SUBMIT THE TWO TEST FIRED CARTRIDGE CASES FOR NIBIN SUBMISSION.

• Digital images of evidence or test fired cartridge cases are acquired and are correlated with other stored digital images.

• Correlation could result in a possible association which means that the firearm could have been used in more than one shooting incident, which has to be confirmed as a ‘HIT’.
TOOL MARKS

• TOOL MARK IDENTIFICATION IS A DISCIPLINE OF FORENSIC SCIENCE WHICH HAS AS ITS PRIMARY CONCERN TO DETERMINE IF A TOOLMARK WAS PRODUCED BY A PARTICULAR TOOL.

• TOOL.
Definition: Tool

1. An object used to gain mechanical advantage
2. The harder of two objects that comes into forceful contact with one another, resulting in the softer object being marked.
3. Anything used as a means of performing an operation
Examples of an Identification
Examples of an Elimination
Examples of an Inconclusive