Section 1 Firearms Physical Exam and Classification

History Page

Revision #	Effective date	History
0	**1/12/07**	**This is an original procedure this procedure has been completely reformatted and updated from the previous procedure that was adopted from the Washington State Patrol.**

Section 1 Firearms Physical Exam and Classification

1.0 Scope and Background

This method is designed to act as a guideline to assist in the proper examination of firearms evidence. The examiner may be further assisted by appropriate technical references as well as private and commercial references. The many variables involved in the examination of firearm related evidence precludes a "recipe" type manual. This analytical method deals with the general, visual, and physical examination of firearms.

1.1. Equipment (refer to section 9 for details on calibration and maintenance of equipment)

Comparison microscope
Stereo microscope
Ruler
Scale/Balance
Micrometer/Caliper

1.2 Reagents

Methanol
Acetone
10% bleach solution (mix bleach with water at about 1:10 prepare fresh)
Dish soap and water

1.3.1 General, visual and physical examination

1.3.1.1 Firearm/ammunition submitted without request for comparison

Visual and physical examinations are conducted to determine the following firearm features, to be recorded in notes.

Caliber/Gauge
Make/Model
Serial number and location
Type of action
Safeties,
Operating condition
Rifling characteristics
Trigger pull (refer to section 3 for analytical method)

1.3.2 Trace Material

Evidence is often submitted with debris that may cover its characteristics. In order to determine class characteristics or compare individual characteristics of the firearm evidence the debris may need to be removed. The debris may consist

of blood, tissue, paint, fibers, glass, etc. The value of the debris as trace evidence should be considered during examination. The examiner may choose to forward the item to another section for testing or to collect the trace evidence and create a new evidence submission. The examiner will note the finding in his or her case notes. After an assessment and appropriate actions have been taken to collect or forward trace evidence, the evidence may need to be cleaned to allow for proper examination of the evidence. The examiner will choose an appropriate cleaning solvent or solution. Typically methanol, acetone, a 10% solution of bleach and water or dish soap and water will be used.

1.3.3 Malfunctioning Firearm Examination

A firearm examiner may be called upon to examine a firearm to determine if the firearm will malfunction. Many of these tests deal with the question: " Will the firearm fire without pulling the trigger?" In these instances it should be the goal of the examiner to acquire a detailed account of the incident, followed by a thorough examination and testing of the firearm. Examinations may include external and internal observations, striking or dropping the firearm in attempts to duplicate the incident as reported. The examiner should attempt to conduct the examinations in a manner so as not to alter the firearm. However, there may be occasions when damage may occur. Any change to the firearm should be specifically documented in the examiner's notes. A systematic approach should be used for the malfunctioning firearm examination, with recording of all findings and observations. No one procedure can sufficiently outline the steps necessary to examine all firearms for any malfunction. The following examinations should serve as a guideline.

1.3.3.1 Visual condition of the firearm as received

Cocked/uncocked
Safety position
Loaded/unloaded
Cartridge position
Stuck cartridge/discharged cartridge cases
Presence and/or location of flares

1.3.3.2 Visual abnormalities

Barrel (loose, damaged, etc.)
Receiver (condition)
Slide (condition)
Parts broken or missing (firing pin, ejector, extractor)
Screws (loose or missing)
Alterations or adaptations
Sights

1.3.3.3 Action- External

Relationships of the action parts
Correct assembly
The proper locking of the action on closing
Cylinder rotation (securely locks)

Hand relationship to the ratchet
Trigger (not returning, sticks, broken spring, etc.)
Trigger Pull (single action, double action) and striking of hammer

1.3.3.4 Safeties

¼, ½, full cock, seating check (any false positions)
Function (grip, magazine, disconnector)
Rebound hammer or inertia firing pin
Firing pin (relationship to primer, condition)
Drop hammer several times to check safeties
Position of the slide or bolt in order to fire
Condition of safeties

1.3.3.5 Action Check

Check feeding magazine (lips, follower), carrier or lifter, and feed ramp
Slamfire
Extractor and/or ejector markings on evidence cartridges/ discharged cartridges.
Marks exhibited on the cartridges/discharged cartridge cases
Check for any inherent "quirks" known about the particular firearm based on literature or case data.

1.3.3.6 Test fire Firearm

Note any operational problems
Check the barrel for obstructions before firing
Misfires
Ammunition involved (proper cartridge type reloads, etc.)
Check consistency of the impression on test-fired components and evidence

1.3.3.7 Action - Internal

Hammer notches (worn, burrs, dirt, etc.)
Sear (worn, broken, burrs, etc.)
Safeties (relationships and general parts relationship)
Springs (weak, broken, altered, etc.)
Signs or any tampering or faulty assembly

1.3.4 Bore/Chamber Casting

Occasionally, firearms are received for which the caliber may not be known or may be different than is designated on the firearm and in the industry literature. In order to facilitate firing of test shots that are the correct caliber for a particular firearm, it may be necessary to make a bore and/or chamber cast. Casts can be made using various casting materials such as low melting point metals and silicone rubber compounds.

1.3.4.1 Insure that the firearm is not loaded
1.3.4.2 Open the action and remove the bolt or bolt assembly
1.3.4.3 Check the bore for obstruction
1.3.4.4 Push a cleaning patch in the barrel, from muzzle end, until it is ½ inch to ¼ inch from the beginning of the chamber

1.3.4.5 Lubricate the chamber
1.3.4.6 Prepare the casting material according to manufactures instructions
1.3.4.7 Pour casting material into the chamber until full
1.3.4.8 Do not allow casting material to flow into the breech as it will make extraction of the cast difficult
1.3.4.9 Remove cast from breech end
1.3.4.10 Use the same steps for casting the bore, but only the last three inches of the bore need to be cast.

1.3.4.1 Interpretation of results

The correct caliber of firearm can be determined by measuring the mouth, base, overall length, rim (if pertinent), shoulder length of the cast, or the diameter of the bore cast. Record the interpretation in the notes.

1.3.5 Sound Suppressor Examination

A silencer or sound suppressor is a device designed to reduce the noise of discharge that is attached to the barrel of a firearm. Silencers can be commercially made or homemade.

1.3.5.1 Examine the device to determine if it is, or is not characteristic of, a silencer or sound suppression device.
1.3.5.2 Check the barrel for obstructions before each firing.
1.3.5.3 A noticeable reduction in sound between firing of the firearm with the device attached vs. the firing of the firearm without the device is sufficient to determine if the device is a sound suppressor.
1.3.5.4 Multiple tests should be conducted with and without the device.
1.3.5.5 Observations shall be recorded in the examination notes.

1.3.6 Classification of Fired Cartridge Cases

1.3.6.1 Caliber determination

Caliber can usually be determined by examination of the headstamp of the cartridge case, and is written as a numerical term that may be depicted with or without a decimal point. If it is not legible on the headstamp, the case can be compared with laboratory standards, manufacturer literature.

1.3.6.2 Determination of Marks

Visual and microscopic examination of cartridge cases may reveal a variety of markings. Types of marks that might be found may be as follows:

- Breech face class marks
- Extractor marks
- Ejector marks
- Resizing marks
- Chamber marks
- Anvil marks (rimfire only)

- Magazine marks
- Ejection port marks
- Other marks

As appropriate, compare marks on cartridge cases tests from a firearm or with other cartridge cases (see section 5)
Only the above marks necessary to effect an identification or elimination are required to be documented in the case notes.

1.3.6.3 Interpretation of results

- May determine caliber and brand/manufacturer/marketer of cartridge case
- May determine if there are suitable markings for identification with a firearm or other fired or chambered components.
- May determine possible firearms that could have fired the cartridge case.
- May be able to identify the firearm in which it was fired or worked through the action of the firearm.

1.3.7 Classification and Examination of Fired Bullet Evidence

1.3.7.1 General, visual, and physical examination

- Caliber/gauge
- Bullet weight
- Number of land and groove impressions
- Direction of twist
- Measured width of land impressions
- Measured width of groove impressions
- Measured diameter
- Bullet composition
- Bullet style
- Possible manufacturer/marketer of the bullet/projectile
- Description of the base of the bullet
- Type and position of cannelures
- Any extraneous markings to include flared base, skid marks, shave marks, and other marks
- Presence of gunpowder and/or powder imprints adhering to the base
- Condition of the fired evidence as received
- Suitability of the fired evidence for comparison purposes
- As appropriate, compare marks on bullets with tests from a firearm or with other bullets (see Section 5)

1.3.7.2 Caliber determination

Caliber, or the base diameter is one of the class characteristics of a fired bullet, and is written as a numerical term that may be depicted with or without a decimal

point. The determination of caliber may aid the examiner during the identification or elimination of a suspect firearm. If no firearm is submitted, the bullet's caliber may be used in determining the General Rifling Characteristics of the firearm involved. The following may be utilized to determine the caliber of a fired bullet. The condition of the bullet will determine which steps can be utilized:

1.3.7.2.1 Compare the base diameter of the evidence bullet directly with known test fired standards

1.3.7.2.2 Measure the base diameter of the evidence bullet using a measuring device and compare this measurement with known measurements published in reference literature

1.3.7.2.3 Determine the number of land and groove impressions and compare to Appendix G, Table 6 of the AFTE Glossary, 4th edition.

1.3.7.2.4 Physical characteristics of the evidence bullet, such as weight, bullet shape, composition, nose configuration, and number and placement of cannelures, may aid in caliber determination.

1.3.7.3 Methods of Measuring Lands and Grooves

The measuring of land and groove impressions on a fired bullet can be accomplished by utilizing either the air-gap method or one of the stereo microscope methods. It may be necessary to measure several suitable land and groove impressions to obtain a reliable measurement.

1.3.7.3.1 Air gap method

In the air gap method the fired bullet in question is mounted on one stage of the comparison microscope. The measuring device is mounted on the other stage. Both stages must be using the same magnification level and be in focus.

The land or groove impression is aligned with one of the anchor points of the measuring device and the measurement recorded.

1.3.7.3.2 Stereo microscope grid method

The fired bullet in question is either held or mounted on a steady surface beneath the stereo microscope.

The land or groove impression of the fired bullet is positioned with both of the anchor points corresponding to points on the alignment grid. The measurement is recorded.

1.3.7.3.3 The stereo microscope ruler method

The fired bullet in question is either held or mounted on a steady surface beneath the stereo microscope.

The land or grove impression at the base of the fired bullet is placed perpendicular to the scale of the ruler. The distance between both of the land or groove impression are measured and recorded.

1.3.7.3.4 LCD measuring scale method

Place the bullet on the left stage and install crosshair eyepiece. Focus and align crosshair with edge of land or groove. Zero the LCD measuring scale. Move stage so crosshair is aligned with other side of land or groove. Record the measurement.

1.3.7.3.5 FBI General Rifling Characteristics File (GRC)

The FBI's General Rifling Characteristics File (GRC) can be utilized when attempting to determine a list of possible firearms that could have fired an evidence bullet when no firearm is submitted. The GRC specifications can be accessed using various software utilities or the printed reference material. The GRC file is an investigative aid and should not be considered as an all-inclusive list of firearms available with those particular class characteristics.

1.3.7.3.6 Interpretation of results

- Caliber is written as a numerical term and may be depicted with or without the decimal point. If the base is mutilated the examiner may only be able to determine that the evidence is consistent with a range of calibers or the caliber can not be determined.
- May determine caliber/gauge, brand, type, style, general rifling characteristics of the fired bullet
- May determine if there are suitable markings for identification with a firearm or with other fired components
- May determine list of possible firearms that could have fired a bullet
- May be able to identify the firearm in which it was fired
- May be able to exclude a firearm from having fired a bullet based on class characteristics.

1.3.8 Physical examination and Classification of Shotshell Evidence

1.3.8.1 Shotshell cases

Examination of shot shell cases may include general, visual, physical, gauge determination, and marks determination:

- Shape of shotshell
- Gauge
- Possible manufacturer/marketer of the shotshell case
- Ignition system
- Description of metal used in hull and primer
- Description of headstamp
- Description of firing pin impression

1.3.8.1.1 Shotshell gauge determination

Gauge can easily be determined by examination of the headstamp of a shotshell case. If the headstamp is not legible, the shotshell can be compared with laboratory standards or available manufacturer literature.

1.3.8.1.2 Determination of marks

Visual and microscopic examination of the shotshell case may reveal a variety of markings. Types of marks that might be found are as follows:

- Breech face class marks
- Extractor marks
- Ejector marks
- Resizing marks
- Chamber marks
- Magazine marks
- Ejection port marks
- Markings on the exterior surface of hull
- Other marks

As appropriate, the analyst will compare marks on shotshell case with test form a firearm or with other shotshell cases (see section 5)

1.3.8.1.3 Interpretation of results

May determine gauge and brand manufacturer/marketer of shotshell case
May determine if there are suitable markings for identification with a firearm or with other fired components.
May determine possible firearms that could have fired the shotshell case.
May be able to determine the firearm in which the shot shell was fired or worked through the action.

1.3.8.2 Wads

1.3.8.2.1 Wad Gauge determination

Gauge can usually be determined by measuring the diameter of the wad and comparing with laboratory standards or available manufactured literature.

- Direct comparison of the evidence wad to a known reference of similar manufacturers in the composition, design, and diameter.
- Gauge size can also be determined by measuring the base diameter of the wad and comparing the measurement to a known wad-reference measurements
- Manufacturer data may be determined by locating information stamped into the wad or by comparing the evidence wad to a

known references. Care must be taken since manufacturers may trade components.

1.3.8.2.2 Determination of marks on wads

Visual and microscopic examination of the wad may reveal a variety of markings. Microscopic examination of the evidence wad could reveal markings that may be suitable for identification with the shotgun that fired it. If evidence shotshells are submitted with the evidence wad, it may be necessary to disassemble one of the shotshells for a comparison of the unfired wad with the evidence wad.

1.3.8.2.3 Limitations of method

If the wad is mutilated or soaked with blood the examiner may not be able to specifically determine the gauge size. Some manufactures may also duplicate the design of other manufactures.

1.3.8.3 Pellets

Visual and microscopic examinations may be done to determine the following:

- Determine the total number of pellets received
- Determine the composition of the pellets
- Determine the number of pellets suitable for comparison purposes
- Note if pellet sizes all appear to be similar - if different determine each size
- Compare evidence pellets to known shot sizes.

1.3.8.3.1 Comparison of pellets by weight

1.3.8.3.1.1 Determine the number of pellets suitable for weighing

1.3.8.3.1.2 Weigh the pellets in grains

1.3.8.3.1.3 Consult known pellet weights in the NRA Factbook, Table 1 of Appendix G of the AFTE Glossary 4th ed., or manufacture's data.

1.3.8.3.1.4 The weight of the evidence pellets can also be directly compared to known pellets using the same number of pellets until a similar known weight is obtained.

1.3.8.3.2 Measuring pellet size

1.3.8.3.2.1 Choose the best specimen and measure diameter using a micrometer/caliper.

1.3.8.3.2.2 Consult known pellet sizes in the NRA Factbook, Table 1 of Appendix G of the AFTE Glossary 4th ed., or manufacture's data or compare to a known sample.

1.3.8.3.3 Interpretation of results

It may be possible to determine the shot size and composition of pellets.

1.3.9 Safety Considerations

This procedure involves hazardous materials, operations and equipment. This procedure does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this procedure to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. Proper caution must be exercised and the use of personal protective equipment must be considered to avoid exposure to hazardous conditions. Consult the appropriate MSDS for each chemical prior to use.

1.3.10 References

Association of Firearm and Toolmark Examiners Glossary, 4th ed. 2001.

Firearms And Toolmarks Technical Procedures Manual, Washington State Patrol

"Physical Examination and Classification of Firearms" Firearms and Toolmarks Procedures Manual , Virginia Division of Forensic Science Amendment C.

NRA Firearms Factbook. National Rifle Association of America.

Mathews, J. Howard Firearms Identification Vol. I, 1973.