1.0 Physical Examination and Classification of Firearms

1.1 Introduction

All firearms must be treated as though they are loaded. This rule cannot be over stressed and must always be followed, whether it is in the evidence receiving area, firearm section, test firing area, or court. Safe firearm handling within the laboratory environment corresponds with safe firearm handling in general. The only way to prevent accidents is always to practice safety. Firearm evidence in the laboratory environment is not dangerous if handled correctly and treated with respect. Occasionally, loaded firearms are received in evidence for an examination. These, of course, need very special handling. It is the responsibility of the firearm examiner to ensure that all appropriate safety function checks are performed on a firearm or item of ammunition prior to test firing.

1.2 Safety Considerations

Examinations performed in the Firearm and Toolmark Section are inherently hazardous. These procedures involve hazardous chemicals, firearms, ammunition, and power tools. All hazardous procedures must be performed in compliance with the Laboratory Operations Manual and the Health and Safety Manual.

1.3 Cleaning Solutions

NOTE: ALWAYS ADD ACID TO WATER. NEVER ADD WATER TO ACID.

1.3.1 Bleach Solution

- Prepare a Bleach Solution as needed by combining 10 milliliters of bleach to 90 milliliters of distilled water
- Discard after use

1.4 Instrumentation

- Standard Trigger Weights
- Digital Trigger Pull Scale
- As appropriate for length measurements: Ruler (and/or) Tape Measure (and/or) Non-marring object, such as a dowel
- Scale/Balance
- Stereo Microscope
- Comparison Microscope

1.5 Minimum Analytical Standards and Controls

Appendix A

1.6 Procedure or Analysis

The evidence will be marked in accordance with the Laboratory Operations Manual (section 4.3). A systematic approach should be used for the physical examination and classification of firearms, with recording of findings and observations in examiner's case notes.

Items that have been processed by the MSP Biology Units are typically given item numbers/identifiers that contain the lab number and subsequent identifier unique to that item. For ease of documentation and review, all firearms personnel may omit the preceding lab number and use the subsequent unique identifier. The preceding lab number of an item shall not be omitted if doing so creates a duplicate item number. If the preceding lab number is omitted from items in the results section of the lab report, a notation should be made at the end of the report stating as much.

1.6.1 Safe Firearm Handling

- The muzzle of the firearm must always be pointed in a safe direction.
- Firearms submitted to the laboratory for examination should be unloaded and in a safe condition.
- Test firing or any examination of the firearm that utilizes ammunition or an ammunition component, will only be performed in designated test firing areas.
- A firearm will not be placed in the evidence room or returned to any agency in a loaded condition.

1.6.2 General, Visual, and Physical Examination

The initial examination of any firearm will include a firearm worksheet. This worksheet should include the manufacturer's data of the firearm and will serve as a source to document the condition of the firearm as received. Further information will be added to the worksheet as tests are performed.

If the firearm being examined was submitted for entry into the IBIS database, a Not Analyzed worksheet may be utilized in place of the standard firearm worksheet. Firearms submitted as part of larger comparison cases must have a standard firearm worksheet.

The Not Analyzed worksheet should, at a minimum, note any defects, damage, modifications or unusual conditions, additional accessories, barrel rifling and type, trace evidence and if maintenance was performed to obtain test shots.

Examine the firearm visually for any trace material. Determine if further examination of trace material is necessary and consult the appropriate discipline prior to the removal of any trace evidence. Document the presence or absence of trace evidence in the notes. Refer to 1.6.3 for additional information about trace evidence processing.

Once the firearm has been examined for the presence of pertinent trace evidence material, visual and physical examinations are conducted to determine the firearm features listed below. For both Examiners and Technicians, the below fields should be addressed and recorded in the worksheet. For Examiners conducting examinations of firearms submitted in cases other than IBIS entry, a more comprehensive examination is recommended.

- Caliber/Gauge
- Make/Model
- Serial number and location
- Cylinder capacity
- Action and type of firearm
- Cylinder rotation (if revolver)
- Safeties present. Internal, External, Manual or Automatic. (Safeties reported are working unless stated otherwise)
- Rifling characteristics
- Number of test shots and brand of ammunition used
- Operable/Inoperable

In instances were a firearm has no serial number the possibility that the frame or receiver was purchased as an unfinished product or an “80%” finished item may be considered. Documentation should include any markings and, if possible, manufacturer information. If there are no markings available that help in determining the make or manufacturer of the item no assumption should be made that it was an unfinished product.

Guidance and information about unfinished frames and receivers can be obtained by contacting the ATF’s Firearms and Ammunition Technology Division (FATD) by email at fire_tech@atf.gov or by phone at (304)616-4300.

For reporting purposes, standard statements that describe the make, model and caliber should be used. If the item submitted does not meet the legal definition of a firearm, and it is determined to be an unfinished product, refer to FAPM 11.0 Reporting Results for acceptable result statements.

1.6.3 Trace Material Examination

Evidence recovered during an investigation may contain trace material transferred from the crime scene. This trace material may be in the form of blood, tissue, plaster, paint, hairs, fibers, glass, etc. The importance and/or relevance of the evidence must be evaluated. If the examiner feels that preservation of the trace material may be beneficial, the submitting agency must be consulted. If it is determined that the material is to be recovered for future analysis, the appropriate discipline shall process the item. Documentation of the request must be recorded in the Case Details Object Repository. Removal of material may also be necessary to allow the proper examination of the evidence.

1.6.3.1 Procedure for Retaining Trace Evidence

If the submitting agency requests that the item be processed for trace, biological or latent print evidence, the item shall be submitted to the appropriate discipline.

1.6.3.2 Procedure if NOT Retaining Trace Evidence

- For evidence containing blood, tissue, or other biohazards, soak or sonicate the evidence for at least ten (10) minutes in a biohazard cleaning solution
- Record findings and observations in the notes

1.6.4 Pre-Firing Safety Examination

A visual examination of firearm prior to test firing is needed to determine:

- Obstruction in the bore
- Signs of cracks or weaknesses in major parts of frame, slide, or barrel
- Overall mechanism functioning
- Type of ammunition appropriate for use with the firearm
- Suitability of evidence ammunition submitted for test firing
- Soundness of chamber/barrel, condition of percussion nipples, existing load in chamber (muzzleloaders)
- If firearm should be test fired remotely due to unsafe firearm condition
- Record findings and observations in the notes

1.6.5 Trigger-Pull Examination

One of the examinations that may be conducted in a firearm identification examination is determining the trigger pull of a firearm. Trigger pull is defined as the amount of force, which must be applied to the trigger of a firearm to cause sear release. This examination can provide information regarding the mechanical operating condition of the firearm. The trigger pull of a firearm can be obtained utilizing standard trigger weights.

1.6.5.1 Single-Action Trigger Pull Utilizing Weights

- Ensure that the firearm is unloaded
- Cock the firearm
- Rest the trigger hook of the standard trigger weight hanger on the trigger where a finger would normally rest, making sure it is not touching any other part of the firearm
- Weights should be hanging parallel to the bore of the firearm
- Add weight until the sear releases
- Note the weight at which the sear releases
- Reset the sear connection after each attempt
- Record the lightest weight necessary for sear release
- Record findings and observations in the notes

1.6.5.2 Double-Action Trigger Pull Utilizing Weights

- Ensure that the firearm is unloaded
- Hold the firearm with the muzzle vertical
- Rest the trigger hook of the standard trigger weight hanger on the trigger where a finger would normally rest, making sure it is not touching any other part of the firearm
- Weights should be hanging parallel to the bore of the firearm
- Add weight until the weight pulls the trigger through the double-action sequence and the sear releases
- Note the weight at which the sear releases
- Reset the sear connection after each attempt

- Record the lightest weight necessary for sear release
- Record findings and observations in the notes

1.6.5.3 Single-Action Trigger Pull Utilizing a Digital Scale

- Ensure the firearm is unloaded
- Cock the firearm
- Attach one end of the scale to a fixed object and position the other end against the trigger
- Slowly pull away from the fixed object until the sear releases
- Note the weight at which the sear releases
- Reset the sear connection after each attempt
- Record the lightest weight necessary for sear release
- Record findings and observations in the notes

1.6.5.4 Double-Action Trigger Pull Utilizing a Digital Scale

- Ensure the firearm is unloaded
- Cock the firearm
- Attach one end of the scale to a fixed object and position the other end against the trigger
- Slowly pull away from the fixed object until the sear releases
- Note the weight at which the sear releases
- Reset the sear connection after each attempt
- Record the lightest weight necessary for sear release
- Record findings and observations in the notes

1.6.5.5 Interpretation of Results

The results acquired are only an approximation and a different technique may lead to a different trigger pull weight. The trigger pull may be recorded to the nearest 1/2 pound. Record the interpretation of results in notes. If the results of testing are inconsistent record this information in the worksheet and report it accordingly.

Firearms and Tool mark examiners will no longer issue a report listing the measured trigger pull value for any firearm. If a submission is received that requests a trigger pull analysis or if it meets a factory specification the firearm must be sent to the manufacturer or serviced by a factory certified technician. The submitting agency will be responsible for contacting the manufacturer or factory certified technician to obtain additional testing.

1.6.6 Barrel and Overall Length Measuring

Firearm and Tool Mark examiners will no longer issue a report listing barrel length or overall length of a firearm.

The investigating agency will be responsible for performing this task and can receive instruction from a Firearm Examiner on proper measuring procedures.

- ATF Guide to Measuring Barrel and Overall Length of a Firearm
- FSD Guidelines to Measuring Barrel and Overall Length of a Firearm - handout for Agencies
- MCL 750.222 definitions:
    - Short-barreled shotgun: one or more barrels less than 18 inches, or overall length less than 26 inches
    - Short-barreled rifle: one or more barrels less than 16 inches, or overall length less than 26 inches

1.6.7 Test Firing

Test firing recovery methods include the water tank, the cotton-waste recover box, the bullet trap, the snail system, and the bullet-trap range. The type of firearm and ammunition tested will usually dictate the type of recovery method used. To perform a microscopic comparison of a submitted firearm or to obtain samples for NIBIN entry, two (2) test shots should be fired and recovered. If a firearm has more than one (1) barrel, two (2) test shots should be fired and recovered from each barrel. If additional test shots are necessary for comparison purposes, notations in the worksheet should detail the necessity.

If the firearm being tested functions as fully automatic, or is suspected to be fully automatic, no more than three (3) cartridges shall be loaded into the magazine.

Other test-fire procedures include downloading ammunition and firing primed cartridges or shot shells. Upon the completion of test firing a weapon, the firearms examiner shall ensure the weapon is unloaded prior to leaving the shooting area.

All unintended discharges of weapons, whether there is damage or injury shall be immediately reported to the Unit Supervisor. The Unit Supervisor shall report this information to the Lab Director and Technical Leader.

No testing procedure shall be employed that may cause a ricochet, deflection or direct strike to the floors, ceilings or walls of the range.

1.6.7.1 Safety Considerations

All firearms must be treated as though they are loaded. This rule cannot be overstressed and must always be followed, whether it's in the evidence receiving area, firearm section, test firing area, or court.

Safe firearm handling within the laboratory environment corresponds with safe firearm handling in general. It is the responsibility of the firearm examiner to ensure that all appropriate safety function checks are performed on a firearm or item of ammunition prior to test firing. Appropriate hearing and eye protection must be used.

The examiner should be aware of the maximum velocity of the projectile that can be fired into a specific water tank or bullet trap, as well as the proper water depth needed for firing. Due to the potential hazard of the firearm malfunctioning or undergoing a catastrophic failure during remote firing, the examiner should be stationed behind a protective shield or at a safe distance from the firearm when discharging the firearm.

1.6.7.2 Water Recovery Tank

The water recovery tank is usually used to recover bullets from handguns, rifles, and slugs fired from shotguns. The cotton-waste recovery box utilizes similar procedures.

- The recovered test-fired components will be marked in accordance with the Laboratory Operations Manual
- The examiner should consider indexing and sequencing each shot
- Proper hearing, body armor and eye protection must be worn
- Ensure that the water level in the bullet recovery tank is appropriate
- Ensure that all lids or doors of the bullet recovery tank are closed and properly secured
- Ensure that the exhaust fan or system is turned on
- Ensure any warning systems are activated
- Check the barrel for obstructions before firing
- The examiner should load no more than two (2) cartridges/shotshells into the firearm during the initial testing of the firearm
- Test firing into the bullet recovery system will be done with the muzzle of the firearm inserted into the shooting tube so that any discharge from the muzzle will be captured within the recovery tank
- Recover the bullets using an appropriate device
- Ejected fired cartridge cases/shotshell cases must be retrieved
- Record findings and observations in the notes

1.6.7.3 Bullet-Trap Range

The bullet trap is usually used to test fire firearms when the recovery of the fired projectile(s) is not necessary. The bullet trap and the snail system utilize the same procedures.

- The recovered test-fired components will be marked in accordance with the Laboratory Operations Manual
- The examiner should consider indexing and sequencing each shot
- Proper hearing, body armor and eye protection must be worn
- Ensure that the exhaust fan or system is turned on
- Ensure any warning systems are activated
- Check the barrel for obstructions before each firing
- The examiner should load no more than two (2) cartridges/shotshells into the firearm during the initial testing of the firearm
- Fire the firearm into the front of the range trap
- Ejected cartridge cases/shotshell cases must be retrieved
- Record findings and observations in the notes

1.6.7.4 Remote Firing

While examining a firearm, it may be determined that it would be unsafe for the examiner to fire the firearm by holding it as designed. If it is necessary to obtain test standards from this firearm, the firearm should be fired remotely. The remote firing platform should be used.

- The recovered test-fired components shall be marked in accordance with the Laboratory Operations Manual
- The examiner should consider indexing and sequencing each shot
- Proper hearing, body armor and eye protection must be worn
- Set up the chosen remote-firing device in front of the appropriate recovery system, as per guidelines set forth by the device manufacturer
- Place firearm in device
- Ensure that the exhaust fan or system is turned on
- Ensure that any warning systems are activated
- Check the barrel for obstructions before each firing
- The examiner should load no more than one (1) cartridge/shotshell into the firearm during the initial testing of the firearm
- Activate the remote device while standing behind a protective shield or at a safe distance away from the firearm
- Pull the string that is attached to the trigger that will cause the firearm to function
- Retrieve the test-fired components
- Record findings and observations in the notes

1.6.7.5 Downloading Ammunition

It may be necessary to reduce the powder load of the cartridge in order to obtain a velocity suitable for safely collecting test-fired components for comparison purposes. Even with a reduced load, it may be necessary to fire the firearm remotely.

- The recovered test-fired components will be marked in accordance with the Laboratory Operations Manual
- Remove the bullet from the cartridge using an inertia bullet puller or a reloading press
- Remove existing powder from the cartridge
- Weigh the powder in accordance with the velocity requirement
- Reload the cartridge with weighed powder that is not less than 80% of the original weight
- Loosely pack a small piece of tissue or other similar material into the cartridge case to fill the gap between the bullet and powder
- Seat the bullet back into the cartridge case using a rubber mallet or a reloading press
- The examiner should consider indexing and sequencing each shot
- Proper hearing, body armor and eye protection must be worn
- Ensure that the exhaust fan or system is turned on
- Ensure that all warning systems are activated
- Check the barrel for obstructions before firing
- The examiner should load no more than one (1) cartridge into the firearm during the initial testing of the firearm
- Retrieve the test-fired components
- Record findings and observations in the notes

1.6.7.6 Primed Cartridge/Shotshell

While examining a firearm, it may be determined that it would be unsafe for the examiner to fire the firearm as designed. If it is not necessary to obtain test-fired components for comparison purposes, the firing condition of the firearm can be tested using a primed, empty cartridge case or shotshell case.

- The recovered test-fired components will be marked in accordance with the Laboratory Operations Manual
- Obtain a primed empty cartridge case in the desired caliber or pull the bullet of a cartridge using an inertia bullet puller or reloading press, retaining only the primed cartridge case
- For shotguns, obtain a primed empty shotshell in the desired gauge or cut open a shotshell removing all components, retaining only the primed shotshell
- A commercial firing pin testing device may be used
- Proper hearing and eye protection must be worn
- Ensure that the exhaust fan or system is turned on
- Ensure that all warning systems are activated
- Check the barrel for obstructions before each firing
- Load the primed empty cartridge case, primed empty shotshell, or a commercial firing pin testing device into the chamber of the firearm and test-fire in front of the bullet trap
- Retrieve the test-fired components
- Record findings and observations in the notes

1.6.8 Rusty Firearm Examination

Rusty firearms or those found in water, etc., may be submitted for examination. Immediate attention must be given to these firearms to prevent further damage to the firearm. The examiner should instruct the agency that recovers the firearm to submit the firearm in a container of the fluid in which the firearm was found. If this is not practical, the agency can be instructed to immediately and thoroughly spray the firearm with a water-displacing product to prevent further deterioration. It should be noted that the firearm might be too rusted to be functional.

An examiner must take all necessary precautions to ensure that the firearm is unloaded. If it cannot be readily verified as being unloaded, it must be examined in an area designated for the firing of firearms. Determining whether a firearm is unloaded may necessitate a complete disassembly, or, in some cases, destruction (e.g. cutting).

1.6.8.1 Procedure

- Determine to what extent restoring the firearm is possible (i.e. for test firing, for recovering manufacturer information, serial number, etc.)
- Soak the firearm in penetrating oil, de-rusting solvents, or similar material to dissolve rust
- Periodically check the firearm until the firearm functions, or the desired information is recovered
- Clean the firearm with gun cleaning solvent, cleaning patches, and cloth (only a non-marring item should be used down the barrel of a firearm)
- Record findings and observations in the notes

1.6.9 Malfunctioning Firearm Examination

A firearm examiner may be called upon to examine a firearm to determine if the firearm will malfunction. Many of these cases will 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 and x-rays. A firearms examiner should not attempt to recreate scenarios where the firearm was reported to have been thrown or dropped. Examinations should also include a check of any recall notices and the specific reason for the recall. If the recall notice describes a possible malfunction condition, the examiner should attempt to recreate the same condition. The examiner should conduct examinations in a manner so as not to alter the firearm. However, if during the testing process damage/alteration does occur, it should be specifically documented in the examiner's notes. A systematic approach should be used for the malfunctioning firearm examination, recording all findings and observations. No one procedure can sufficiently outline the steps necessary to examine all firearms for any malfunction. The following list of examinations should serve as a guideline. It should also be noted that firearms examiners are not trained as gunsmiths. If the source of the malfunction is critical to the case it is recommended the weapon be taken to a gunsmith or referred to the manufacturer for a professional opinion.

1.6.9.1 Visual Condition of Firearm as Received

- Cocked/uncocked
- Safety position
- Loaded/unloaded
- Cartridge position
- Stuck cartridge/discharged cartridge cases

1.6.9.2 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

1.6.9.3 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

1.6.9.4 Safeties

- ¼, ½, full cock
- 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

1.6.9.5 Action Check

- Check feeding of magazine (lips, follower), carrier or lifter, and feed ramp
- Slam fire
- Extractor and/or ejector markings on evidence cartridges/discharge cartridge cases
- Marks exhibited on the cartridges/discharged cartridge cases

1.6.9.6 Test Fire Firearm

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

1.6.10 Casting- Firearms

Occasionally, evidence items may need to be replicated for testing purposes, or for other case-dependent circumstances. This can include, but is not limited to fired ammunition components, unfired ammunition and/or components or firearm surfaces.

Additionally, firearms may be received for which the caliber may not be known or may be different than is designated on the firearm and in the literature. To facilitate firing of test shots that are of the correct caliber for a particular firearm, it may be necessary to make a bore and/or chamber cast. Then, by measuring the cast, the correct cartridge can be selected for test firing. The presence of subclass characteristics on the breech face and barrel, the widths of the lands and grooves and the rifling type may be determined by examining a bore cast.

Casts should be made using AccuTrans, Mikrosil or a similar forensic silicone casting material.

1.6.10.1 Procedure

- Ensure that the firearm is not loaded and safe
- Check the bore for obstruction
- Refer to instructions here: Casting with AccuTrans

1.6.10.2 Interpretation of Results:

The correct caliber of the firearm can be determined by measuring the diameter, overall length, rim (if pertinent), and shoulder length of the chamber cast. Refer to the current available edition of Cartridges of the World or the SAAMI Cartridge and Chamber Drawings for caliber and/or cartridge determination based on measurements. Drawings are available for Rimfire Sporting Ammunition, Centerfire Pistol and Revolver Cartridges, Centerfire Rifle ammunition and Shotshell Ammunition. Record the interpretation of results in the notes.

1.6.11 Disposition of Test Shots

Tests may be produced from submitted evidence ammunition or laboratory stock ammunition. The tests shall be marked in accordance with the Laboratory Operations Manual. Test shots are considered evidence. The item number of the firearm the test shots are taken from shall be noted in the report. See section 6.7.3 of the Firearms/Toolmarks Procedural Manual for storage of test shots.

Analysis of tests produced from ammunition submitted as evidence will be reported in the Laboratory Report.

1.6.12 Ammunition Reference Library

The Ammunition Reference Collection is defined as a collection or cataloging of ammunition and components utilized for various scientific reasons, such as:

- To identify the manufacturer's ammunition designation and source of evidence ammunition or component parts
- To provide a resource for the identification of ammunition components recovered at a crime scene or from autopsies
- To provide an exemplar resource for training purposes

Space, storage containers, and computer equipment available will govern each laboratory's ammunition reference collection; however, the following should be considered:

- Use of architect blueprint cabinets, map drawers, or similar style cabinets for storage of the collection
- Use of clear plastic tubes or boxes for storage of each ammunition entry. The entry consists of at least one whole cartridge/shotshell and one cartridge/shotshell broken down into its component parts
- Recording ammunition information should include:
    - Manufacturer
    - Bullet weight
    - Bullet style or configuration
    - Headstamp
    - Other pertinent information

1.7 Appendices

Appendix A - Calibration Standards

1.8 References

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