Department of Forensic Science

FORENSIC SCIENTIST- NIBIN PROCEDURES MANUAL

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INTRODUCTION

The information in this Procedures Manual was collected from the Association of Firearm and Tool Mark Examiners (AFTE) Procedures Manual and other sources. It is presented here for easy reference for NIBIN Forensic Scientists. This manual presents a basic outline of procedures most routinely used to analyze firearms and ammunition submitted to the Firearm/Toolmark Section of the Virginia Department of Forensic Science (DFS) for firearm function/operability and NIBIN entry/correlation review. This manual, in combination with the Forensic Scientist - NIBIN Training Manual, provides the basis for effective quality management of analysis. The Department's Quality Manual (QM) provides additional guidelines.

Every case is unique and must be evaluated by the individual examiner. Not all possible analyses that may be encountered in casework can be appropriately covered in a procedures manual nor can all possible variations to a described procedure be included. It is always the examiner's responsibility to choose the best analytical scheme for each individual case, particularly for evidence not routinely encountered.

It is expected that Section Supervisors shall be consulted, and the Physical Evidence Program Manager shall be notified of deviations from existing procedures in accordance with the Department of Forensic Science Quality Manual.

New methods must be validated before use. Published methods must be verified to work in each Regional Laboratory before use. Prior to beginning a validation process, consult the Section Supervisor who shall consult with the Physical Evidence Program Manager for determination and approval of an appropriate validation plan.

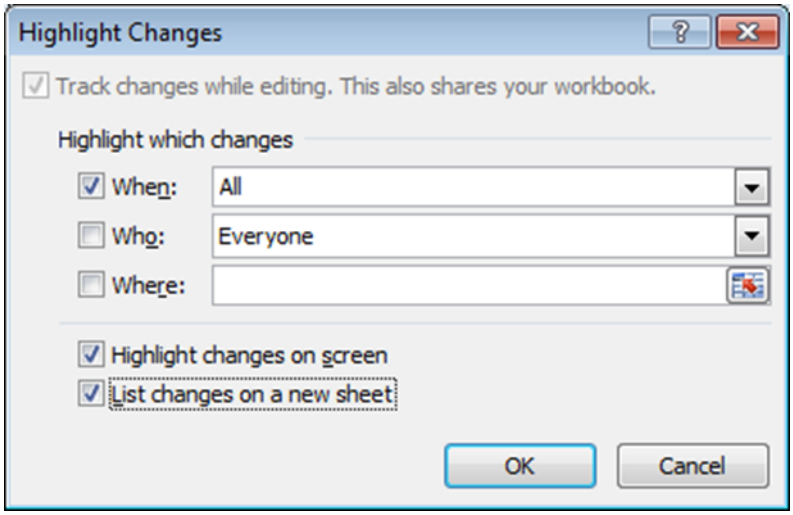
Examination Documentation

Examination documentation can be recorded electronically, using the current, approved and controlled Excel worksheets.

Worksheets shall be saved in a folder on the examiner's laptop H drive or other networked folder prior to recording examination documentation. This approach allows changes to be tracked appropriately. Examiners shall ensure their Microsoft Office setting includes their first and last name.

Tracked changes history shall be printed at the time the electronic worksheet is printed. (Review > Track Changes > Highlight Changes).

Check the "When" box and select "All" in the space provided. Check the "List changes on a new sheet" box.



If all changes in the "Old Value" history are <blank>, complete the following steps on history worksheet:

- Click the down arrow in Action Number, select Number Filters and Less Than
- Place a 1 in the box next to the "is less than" box. Select OK.
    - This will hide all <blank> Old Value changes.
- Print this worksheet and associated history.

If there are changes in the history that are <blank> and other cell changes, filter out the "Old Value" to remove the <blank> from the worksheet.

- Click on the down arrow in Old Value, uncheck the <blank> box and select OK.
    - This hides the <blank> History and shows the tracked changes that have been made to the worksheet.
- Print this worksheet and associated history.

The printed history worksheet will document any tracked changes including no changes. If the tracked changes history cannot be generated, contact the Program Manager for a Memorandum for Record documenting the deviation.

Each electronic worksheet and its associated history worksheet shall be printed for Technical/Administrative Review. Any additional changes to the printed examination documentation shall follow the Quality Manual guidelines. All electronic worksheets shall be removed from the examiner's laptop after the Technical/Administrative Review is complete.

Examination records shall include each examination activity conducted, to include the sequence and results of each, which will allow for another examiner to evaluate the data, interpret the results and come to the same conclusion and also be able to repeat the various steps used by the examiner in the analysis under conditions as close as possible to the original. When recording a measurement, the value displayed on the device shall be recorded in its entirety.

Internet references included in examination documentation shall, at a minimum, contain the website address and the date accessed/printed.

The examination documentation shall contain documentation as to the types of materials that are generated during the analysis. Tests and casts produced during analysis shall be considered evidence. Tests produced from laboratory materials will be created in LIMS, listed on the Request for Laboratory Examination form (RFLE) and on the Certificate of Analysis (CoA) as sub-items of the firearm from which they were produced. Documentation shall be on the RFLE, indicating the container in which the tests are being returned, in addition this information will be included on the CoA.

There are no specific environmental factors, outside those provided in a standard laboratory facility, which would influence the quality of the test results.

Each worksheet shall contain a start and end date, documenting the date(s) the laboratory activity was conducted.

All evidence shall be marked in accordance with the QM.

- An engraver or scribing tool shall not be used on firearms that can be recognized by a unique serial number; the firearm will be marked using a permanent marker and/or gun tag. PMF and firearms with obliterated serial numbers shall be marked, in an inconspicuous location, with an engraver or scribing tool. If a firearm does not fall into the previous category and cannot be recognized by a unique serial number, consult with the Supervisor to determine the best method for marking.

Evidence Storage

Short term storage is used when evidence is in the process of examination or is waiting for instrumental support results. Evidence generally will not remain in short term storage for longer than 90 days. After this time period, evidence must be placed into long term storage according to the QM**.**

Trace Evidence

Examine the item visually and microscopically for any trace material. Document the presence of possible blood, tissue, plaster, paint, hair, fiber, glass and/or other materials. Consult the RFLE or submitting agency to determine if further examination of trace material is necessary. Consult, if necessary, with the appropriate discipline prior to the removal and packaging of trace evidence.

If the material IS NOT going to be retained for further examination, proceed with the following, as necessary:

- For evidence containing blood, tissue, or other biohazards, as practical based on evidence type and size, place the evidence into an appropriate beaker containing a 10% bleach solution (refer to Section 4 for solution preparation) to soak for at least one (1) minute, followed with water rinse.
- Use of an ultrasonic bath may assist with loosening debris more efficiently. Care should be taken when using an ultrasonic bath to minimize damage to the evidence.
- Remove loosened material by rinsing with methanol or water.
- Remove plaster by soaking in a 15% Acetic Acid Solution (refer to Section 4 for solution preparation) or other appropriate solution.
- Remove paint by soaking in alcohol, acetone or other appropriate solution.
- Use a non-abrasive brush to remove loose material.
- Use TergAZyme® for removal of tissue, Naval Jelly or E-zest cleaner to remove dark stains, as needed.
- Record steps taken and observations in examination documentation.

1 PHYSICAL EXAMINATION AND CLASSIFICATION OF FIREARMS

1.1 Introduction

All firearms must be treated as though they are loaded. DFS personnel are responsible for following proper firearms handling and safety procedures and shall have a working knowledge of the operation of test firing/recovery equipment. It is the responsibility of the NIBIN Forensic Scientist to ensure that all appropriate safety checks are performed on a firearm or item of ammunition prior to test firing.

1.2 Safety Considerations

- 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; however, the examiner must first safety check a weapon to ensure that it is unloaded before conducting any other examinations.
- If a firearm is found to be loaded, the Supervisor shall be notified, and it shall be documented in the examination documentation.
- A magazine received in a loaded condition must first be unloaded prior to conducting any examinations with it using a firearm.
- Test firing or any examination of the firearm that utilizes ammunition or an ammunition component shall only be performed in designated test firing areas.
- Firearms shall be fired in the manner in which they were designed. If it is not possible to fire the weapon from the shoulder or using standard hand positions, a remote firing device shall be used.
- After the examination is completed, a safety appliance shall be placed in/through the action for return to the agency.
- If the examiner is not familiar with the function of a firearm or if there is any doubt about the operability of a firearm, they should consult with the Section/Group Supervisor before test firing.
- All observers in test firing areas will stand behind the shooter.

1.3 Instrumentation

- Ruler, Tape Measure, Non-marring rigid rod
- Scale/Balance
- Stereo Microscope

1.4 Minimum Analytical Standards and Controls

Ensure the equipment utilized in the examination has been appropriately calibrated and/or performance checked prior to use. See Section 4of this manual for specific requirement.

1.5 Procedure or Analysis

1.5.1 General, Visual, and Physical Examination

At a minimum, record the following firearm features:

- Caliber/Gauge
- Make/Model
- Serial number
- Operating condition
- GRC (number and direction)

If submitted evidence cartridges are examined or used to generate test fires they shall be appropriately marked, documented in the examination documentation and the result listed on the CoA.

It is acceptable to place non-examined evidence cartridges in a marked proximal container and document the number received and that no examination was conducted in the examination documentation and on the CoA.

1.5.2 Pre-Firing Safety Examination

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

- Possibility of bore obstruction
- Signs of cracks or weaknesses in major parts of frame, slide, or barrel
- Overall mechanism functioning
- Type of ammunition appropriate for use with 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 any deficiencies noted and observations on worksheet
- Check to ensure the firearm disconnects for semi-auto fire
- Presence of Bump-stock-type device
    - Devices that allow a semiautomatic firearm to shoot more than one shot with a single pull of the trigger by harnessing the recoil energy of the semiautomatic firearm to which it is affixed so that the trigger resets and continues firing without additional physical manipulation of the trigger by the shooter.
    - The presence of a Bump-stock-type device shall be documented in the examination documentation and on the CoA.
- Presence of modified slide cover plate (i.e., Glock switch, auto sear)
    - Device that allows a semiautomatic firearm to shoot more than one shot with a single pull of the trigger.
    - The presence of a modified slide cover plate shall be documented in the examination documentation and on the CoA.

1.5.3 Test Firing

Test firing recovery methods include the water tank, the cotton-waste recovery box, the Detroit 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. In order to perform a microscopic comparison of a submitted firearm, a minimum of two (2) test shots should be fired and recovered. Other test firing procedures may include downloading ammunition and firing primed cartridges or shotshells.

When an examiner has test fired a firearm with the intention to recover projectiles or cartridge cases and a projectile or cartridge case is unable to be located, a Supervisor or designee shall be notified and assist with the search. If the projectile or cartridge case is not located after a second search by the Supervisor or designee, then the Laboratory Director and Program Manager shall be notified. The Supervisor, utilizing the Qualtrax workflow, shall record the FS Lab# and a description of the bullet or cartridge case. An additional test fire shall be conducted to ensure at least two cartridge cases and two bullets are returned for future comparisons. Report wording specified in Section 5.3.3 shall be included on the CoA.

If the bullet or cartridge case is recovered after the evidence has been returned, the bullet or cartridge case shall be returned, and a Supplemental CoA shall be issued containing language detailed in Section 5.3.4.

Firearms with missing or broken parts may have to be test fired using parts from the reference collection. Document in notes the part utilized to test fire the questioned firearm along with the make, model, caliber and serial number or the tag number assigned to the reference firearm or magazine.

Documentation shall be included in the notes and on the CoA if the magazine submitted was used to obtain test fires or if a reference collection magazine was used.

Consideration should be given to indexing and sequencing each shot.

When it is possible to determine why the firearm is not in mechanical operating condition and steps are taken to restore the mechanical operation, these details shall be reported. Restorative actions are at the discretion of the examiner and may include, but are not limited to, replacing missing or broken components and/or cleaning due to corrosion, excessive dirt /debris or rust damage.

1.5.3.1 Safety Considerations

- Check the barrel for obstructions before firing
- Appropriate hearing and eye protection must be used
- Ensure the maximum velocity of the projectile is within the acceptable limits of the particular water tank or bullet trap utilized
- Ensure the tank contains the proper water depth needed for firing
- Ensure that the exhaust fan or system and all warning systems are activated
- Keep your finger off the trigger until ready to fire
- Always be aware of what is behind your target
- The firearm should be loaded and made ready to fire ONLY when the muzzle of the firearm is pointed down range or into the shooting port of a bullet recovery system
- If a remote firing device is utilized, the examiner should be stationed behind a protective shield or at a safe distance from the firearm when discharging the firearm
- If a misfire occurs, keep the firearm pointed down range or inserted into the port of the bullet recovery system for at least 10 seconds before opening the action
- After test firing, ensure the firearm is unloaded and the magazine is removed before exiting the range

1.5.3.2 Water Recovery Tank/Cotton Box

A water recovery tank or cotton box shall be used during the initial test firing of handguns and rifles, to the best extent possible. The notes shall delineate when it is not possible. These devices may also be used to retrieve slugs fired from shotguns.

- Ensure that all lids or doors of the recovery system are closed and properly secured.
- No more than two (2) cartridges/shotshells should be loaded into the firearm during the initial testing of the firearm.
- Test firing into a bullet recovery system shall 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 system.
    - It is acceptable for the muzzle to be lined up with the shooting tube, but not inserted, if the firearm is secured in the remote firing cart. The examiner shall load no more than one (1) cartridge/shotshell into the firearm when test firing in this capacity.
- Bullets shall be recovered using an appropriate device.
- Fired cartridge cases/shotshell cases shall be retrieved.

1.5.3.3 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 Detroit bullet trap and the snail system utilize the same procedures.

- No more than two (2) cartridges/shotshells are to be loaded 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

1.5.3.4 Remote Firing

During the course of 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 CyberNational Remote Firing Cart (or a similar device) can be utilized for firing long arms and some handguns.

- Set up the remote-firing device in front of the appropriate recovery system, as per guidelines set forth by the device manufacturer
- Place firearm in device
- Dry-fire the firearm in the remote firing device before using ammunition
- The examiner shall 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
- Retrieve the test-fired components

1.5.3.5 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.

- Remove the bullet from the cartridge using an inertia bullet puller or a reloading press
- Remove existing powder from the cartridge
- Weigh the pulled bullet
- To determine the velocity requirement for safe testing, consult a reloading manual, such as Lyman, to determine the powder charge for the weight of the pulled bullet
- Weigh the powder in accordance with the velocity requirement
- Reload the cartridge with weighed powder that is not less than 30% 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
- 50% downloading CANNOT be used with slow burning powders
- 50% downloading CANNOT be used with many non-canister powders
- Check the barrel for obstructions before each firing

1.5.3.6 Primed Cartridge/Shotshell Case

During the course of examining a firearm, it may be determined that it would be unsafe for the examiner to fire the firearm as received in its current condition. 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.

- 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 case 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
- Load the primed, empty cartridge/shotshell case, or a commercial firing pin testing device into the chamber of the firearm, and test fire in the designated test firing area
- Repeat if the firearm has more than one action
- Retrieve all test-fired components

1.5.3.7 Test Fired Ammunition

Tests may be produced from submitted evidence ammunition or laboratory stock ammunition/components. Case documentation shall include the specific date(s) tests are generated.

Tests shall be sealed in an appropriate container, (small envelope, plastic bag, specimen box) which shall be labeled in accordance with the Quality Manual and with the following information: item #, firearm brand, model, caliber and serial number.

Tests produced from laboratory stock ammunition shall be returned in the same container with the firearm which generated the tests.

Tests from laboratory stock ammunition shall be listed as a sub-item of the firearm which generated them on the RFLE, in LIMS and on the CoA.

Tests made from evidence ammunition shall be returned in the same container in which the evidence cartridges/shotshells were received.

Additional test fired components from laboratory stock ammunition may be retained in the laboratory for reference or training purposes. Refer to Section 4 of this manual for specific requirements related to reference collections.

1.5.4 Privately Made Firearms (PMFs) and Full-auto Firearms

PMFs and firearms known to function in full-auto capacity should initially be test fired on the range. These firearms may be test fired into the water recovery tank/cotton box by loading a single cartridge each time.

1.5.5 Rusty Firearm Examination

Rusty firearms or those found in water, etc., may be submitted for examination. Immediate attention must be given to the firearms recovered from water to prevent further damage to the firearm, which may require coordinating with other sections to expedite the case when multiple exams are requested. 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 such as WD-40® or other similar 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 or not a firearm is unloaded may necessitate a complete disassembly, or, in some cases, destruction (e.g., cutting).

- Determine to what extent restoring the firearm is possible (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)

1.5.6 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. By measuring the cast, the correct cartridge can be determined for test firing. Casts can be made using various casting materials.

- Ensure that the firearm is not loaded
- Open the action and remove the bolt or bolt assembly
- Check the bore for obstruction
- Push a cleaning patch in the barrel, from muzzle end, until it is ½ inch to ¼ inch from the beginning of the chamber
- Lubricate the chamber with gun oil, a silicone spray, or some other similar substance such as WD40®
- Do not allow casting material to flow into breech as it will make extraction of the cast difficult
- When casting material is set or cool, depending on type used, gently tap end of cleaning rod to loosen the cast from the chamber and then remove the cast from the breech end
- Use the same steps for casting the bore

1.5.6.1 Interpretation of Results

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

Record the interpretation of results on an appropriate worksheet.

1.6 References

"A Guide to Firearms Safety". A Safety and Educational Publication of the National Rifle Association. May 1994.

Association of Firearm and Tool Mark Examiners Procedures Manual, 2001.

Biasotti, A. A. "Vise/Rest for Remote Firing." AFTE Journal. Vol. 11. No. 4. p. 16.

"Bullet and Cartridge Case Recovery." AFTE Journal. Vol. 16, No. 2, p.75.

Code of Virginia §18.2-308.6

DeForest, Gaensslen, and Lee. Forensic Science: An Introduction to Criminalistics. New York: McGraw Hill.1983.

Denio, Dominic. "Making a Rusted Gun Functional." AFTE Journal. Vol. 13. No. 3. p. 29.

Glossary of the Association of Firearm and Tool Mark Examiners, 5th ed. 2007.

Howe, Walter, J. "Laboratory Work Sheets." AFTE Newsletter. No 2. August 1969. p. 13.

Lyman Reloading Handbook for Rifle, Pistol and Muzzle Loading. Lyman Gun Sight Products. Middlefield, Conn.1971.

McBrayer, William S. "What? Another Water Tank and Bullet Stop!" AFTE Journal. Vol. 10. No. 2. p. 90.

NRA Firearms Fact Book. National Rifle Association of America. 3rd ed. 1989.

"New Ballistics Tank from Detroit-Armor Corporation Allows Fast Recovery Without Projectile Distortion." AFTE Journal. Vol. 16, No. 3, p.106.

Poole, Robert A. "Mikrosil Casting Material Information." AFTE Journal. Vol. 15. No. 2, p. 80.

"Reduced Powder Loads." AFTE Newsletter. No. 3. p. 14.

"Safety On" CD, 1998.

Speer Reloading Rifle and Pistol Manual. Blount Inc., Sporting Equipment Division. Lewiston, ID 1994.

Striupaitis, Peter P. "Bore Casting Techniques for Caliber Designation of Rifles." AFTE Journal. Vol. 15, No. 2, p. 88.

"The Proper Method for Measuring Weapons." AFTE Journal. Vol.14, No. 3, p. 10.

U.S. Code Title 18, Chapter 44, Section 921, paragraph 24 (Gun Control Act of 1968) – can be accessed at http://www.nraila.org/federalfirearms.htm

VA Department of Forensic Science Forensic Scientist NIBIN Training Manual.

www.afte.org

2 PHYSICAL EXAMINATION AND CLASSIFICATION OF CARTRIDGES AND TEST FIRED CARTRIDGE CASES

2.1 Introduction

The initial examination of any submitted test fired cartridge case orcartridge evidence shall include the completion of a worksheet which shall include the physical description to document the condition of the evidence as received and any tests performed.

2.2 Safety Considerations

Follow the procedures outlined in the Introduction section to clean evidence with appropriate solutions if biohazard material, blood or tissue is present.

2.3 Instrumentation

- Comparison Microscope
- Stereo Microscope
- Micrometer/Caliper
- Ruler
- Scale/Balance

2.4 Minimum Analytical Standards and Controls

Ensure the equipment utilized in the examination has been appropriately calibrated and/or performance checked prior to use. See Section 4 of this manual for specific requirement.

2.5 Procedure or Analysis

The evidence shall be marked in such a way to protect characteristics which may be used for microscopic comparison.

2.5.1 General, Visual, Physical, and Trace Examinations

Record the following features:

- Caliber
- The possible manufacturer/marketer of the cartridge/cartridge case. If needed, use reference materials (i.e., ammunition database) and indicate in notes the number assigned to this reference.
- Description of metal used in cartridge case and primer.

2.5.2 Cartridge Component Verification

2.5.2.1

At times, a request may be made for examination of a cartridge for determination that its composition meets the legal definitions of “ammunition” and “explosive material” as specified in the Code of Virginia. These examinations shall be documented in the “remarks” section of a cartridge worksheet.

- The cartridge shall be disassembled
- Components shall be documented, including the type of powder

2.5.3 Caliber Determination

Caliber can usually be determined by examination of the headstamp of the cartridge/cartridge case. If the caliber cannot be determined from the headstamp, the cartridge/cartridge case can be compared with

laboratory standards, available manufacturer literature, or other appropriate references. Document in the notes the reference utilized to determine caliber.

2.6 References

Association of Firearm and Tool Mark Examiners Procedures Manual, 2001.

Code of Virginia §18.2-308.2(D).

Glossary of the Association of Firearm and Tool Mark Examiners, 5th ed. 2007.

Howe, Walter, J. “Laboratory Work Sheets”. AFTE Newsletter. No. 2, August 1969, p. 13.

VA Department of Forensic Science Forensic Scientist NIBIN Training Manual.

www.afte.org

3 NIBIN

3.1 Introduction

The National Integrated Ballistics Information Network (NIBIN) is a computerized system for acquiring and storing the images of unidentified bullets and cartridge cases as well as known bullets and cartridge cases. DFS currently only enters cartridge cases and shotshell cases.

Access to NIBIN, which is an Individual Characteristic Database (ICD), is defined in the Quality Manual.

Access to the system shall occur after successfully completing NIBIN training, receiving security clearance and the issuance of a password by ATF. The NIBIN Procedures Manual (IBIS Training Manual) should be followed in order to make entries into the system.

The test samples entered into NIBIN are considered evidence and shall be handled as outlined in the Quality Manual.

In addition to state and local NIBIN sites located in Virginia, the automatic searches will include cases entered by the ATF for Zone 1. ATF Zone 1 generally includes agencies within Connecticut, District of Columbia, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Virginia, Vermont and West Virginia, but not all agencies in these states submit cases to the ATF.

For jurisdictions served by the Northern Laboratory, the District of Columbia Department of Forensic Sciences, ATF Washington, D.C. Mobile Command Center and Prince George's County Police Department (Maryland) shall be searched manually for every entry, in addition to the automatic search.

The CoA shall include sites searched beyond those included in the automatic and manual searches noted above.

3.2 Safety Considerations

Follow the procedures outlined in the Introduction section to clean evidence with appropriate solutions if biohazard material, blood or tissue is present.

3.3 Instrumentation

NIBIN System
Stereomicroscope
Comparison Microscope

3.4 Minimum Analytical Standards and Controls

3.4.1 When problems occur with the system such that Ultra Electronics/Forensic Technology (FTI) is contacted, track the problem and resolution.

3.4.2 Performance Check

3.4.2.1 To ensure that the NIBIN System is working properly, a designated specimen (questioned) shall be entered and searched weekly against a previous entry of the same specimen (known). The correlation list with the hit indicated shall be retained in a binder located by the NIBIN System for the assessment cycle.

3.4.2.2 If the known candidate is not on the correlation list, the entry shall be re-correlated. If the known candidate does not appear on the second correlation list, the questioned shall be

re-entered and correlated. If the known candidate does not appear on the correlation for the second entry, the Section Supervisor shall be notified to research the problem. The problem and resolution shall be documented on the printout for the performance check. NIBIN entries made since the last performance check may need to be researched depending on the identified problem.

3.4.2.3 Once the performance check is successfully completed, the questioned specimen shall be deleted from the system.

3.5 Procedure or Analysis

3.5.1 NIBIN Entry

3.5.1.1 The suitability of the items being entered is accomplished through the evaluation of the firing pin impression, breechface impression, and/or ejector mark. An item determined to have insufficient marks for entry shall have been evaluated in all three areas.

The following types of firearms are most amenable for NIBIN entry:

- Semiautomatic pistols
- Semiautomatic rifles
- Self-extracting/ejecting and slide action shotguns
- Long guns chambered to fire handgun ammunition

If other types of firearms are being considered for NIBIN examination, it is advised to contact the Section Supervisor for guidance on the suitability for NIBIN entry.

3.5.1.2 Any test fired cartridge case/shotshell case selected for entry into NIBIN must have sufficient individual characteristics to be considered suitable for identification purposes. If, in the same case, there is more than one identified test fired cartridge case/shotshell case suitable for entry into NIBIN, the examiner should select the best marked item for entry. At the discretion of the examiner, additional cartridge cases/shotshell cases may be entered if individual characteristics are more prominent and/or more reproducible on different tests and/or specimens.

3.5.1.3 Items shall be entered with a unique identifier. If the entry is a test fired component, the item designator shall indicate the specific test that is entered.

3.5.1.4 Images shall be captured in 3D. If not possible refer to the Deviation Protocol in Section 5 of the QM.

3.5.1.5 Per the ATF Minimum Required Operating Standards (MROS) the following firearms information shall be entered into NIBIN if available at the time of acquisition:

3.5.1.5.1 Make, Model, Caliber, Type, Serial number as well as Importer Name and State (if applicable).

3.5.2 NIBIN Correlation

3.5.2.1 The “Unified Score” correlation setting shall be set to Top 20 Best Scored Result with the 2D and 3D score columns visible. The top 20 candidates in the Unified Score list shall be reviewed.

3.5.2.1.1 If candidates outside the top 20 are reviewed, the reason for the additional review shall be documented.

3.5.3 Examination Documentation

The notes shall contain a printout of the NIBIN entry breechface image, which includes the date entered, unique identifier of the evidence, the list generated from NIBIN of the images viewed and the results of the correlation.

If there is a potential association, the notes shall contain the agency information and item numbers of evidence that may be associated. A direct comparison is required for a hit confirmation (identification) to be reported.

If a manual correlation is done for sites not included in the automatic search the reason shall be documented on an MFR, in the examination documentation or the RFLE.

3.5.4 Potential Association

3.5.4.1 A secondary correlation review of each potential NIBIN association shall be completed by a qualified examiner prior to communicating the results. A correlation review is an on-screen comparison of digital images to determine the potential for two cartridge cases to have been fired in the same firearm.

3.5.4.1.1 The secondary correlation review shall be documented by the examiner placing their handwritten initials on the side-by-side printout at the time the review is completed.

3.5.4.1.2 Per the ATF Minimum Required Operating Standards (MROS):

3.5.4.1.2.1 A Lead (potential association) is created when the "crosshairs" icon is activated and the user clicks "OK". The Lead shall be recorded upon concurrence with the secondary review.

3.5.4.1.2.2 A Hit (microscopic confirmation) is recorded when the confirmation date is entered in the "Date" field.

3.5.4.1.3 If a difference of opinion occurs in the secondary correlation review, the following procedure shall be followed.

3.5.4.1.3.1 The original and verifying examiners shall discuss the basis for their conclusion. Notification shall be made to the Section Supervisor and the Physical Evidence Program Manager. When changes to the conclusions are made following a consultation between the examiners, the notes shall include the reason for the change of opinion and this information shall be conveyed to the Section Supervisor and the Physical Evidence Program Manager.

3.5.4.2 A potential association shall be communicated to the submitter on a CoA without recalling evidence for direct comparison.

3.5.4.3 The CoA shall include the associated FS Lab#(s) and Submitting Agency Case number(s) with instruction to resubmit the evidence if a hit confirmation is necessary. If an association is made to a case that was not entered by DFS, the agency's name and case number shall be included on the CoA. The CoA shall serve as notification of the potential association and it is at the discretion of the submitting agencies to determine if a hit

confirmation is necessary. A NIBIN Cartridge Case Image Comparison Exhibit Information printout with a statement that confirmation of the potential association will require resubmission of the evidence shall be provided, after the technical and administrative review is complete, to the other agencies involved in the potential association for cases entered by DFS personnel.

3.5.4.3.1 The following is an example of the wording to be placed on the NIBIN Cartridge Case Image Comparison Exhibit Information printout:

Potential Association – Unconfirmed
Correlation review indicated a potential association between the cases listed on this page. Please contact the examiner listed for assistance in facilitating the submission of evidence if confirmation of any potential associations is necessary.

3.5.4.3.2 The NIBIN Cartridge Case Image Comparison Exhibit Information printout shall be retained in the Case Records Object Repository for the associated case(s).

3.5.4.3.2.1 If the NIBIN Cartridge Case Image Comparison Exhibit Information printout is emailed, a copy of the email shall be retained in the Case Records Object Repository. Include the following statement in the email: Please see the attached for information regarding a potential NIBIN association.

3.5.4.3.2.2 If the NIBIN Cartridge Case Image Comparison Exhibit Information printout is mailed the following is an example of the statement to be included in the accompanying cover letter: Please see the enclosed for information regarding a potential NIBIN association.

3.6 References

The NIBIN Procedures Manual

ATF Minimum Required Operating Standards (Effective July 2018, As of April 22, 2019)

4 QUALITY ASSURANCE

4.1 Introduction

4.1.1 The purpose of this section is to provide a uniform Quality Assurance Program for the Firearm/Toolmark Section of the Virginia Department of Forensic Science. It is to establish a baseline or reference point of reliability and system performance.

4.1.2 For further detail, refer to the Quality Manual.

4.1.3 Maintenance, calibrations and performance checks performed per this section shall be documented on the appropriate form.

4.1.4 If measuring equipment is damaged, it shall be taken out of service and either replaced or repaired.

4.2 Reagents

4.2.1 Chemicals and solvents used in reagents should be of at least ACS reagent grade, if possible.

4.2.2 Water used in reagent preparation should be reverse osmosis (R/O) or deionized (DI).

4.2.3 Cleaning Solutions

It is not required to record cleaning solutions in the Reagent Preparation Log. Solutions should be stored in labeled containers.

4.2.3.1 15% Acetic Acid Solution

Add 150 mL Glacial Acetic Acid to 850 mL R/O or DI water

4.2.3.2 Bleach Solution

Add 10 mL bleach to 90 mL of R/O or DI water

4.2.4 All laboratory prepared reagents/solutions will be clearly labeled as outlined in the Quality Manual.

4.3 Balances

TABLE 1: Balances and Appropriate Check Weights

BALANCE TYPE	BALANCE EXAMPLES	CHECK WEIGHTS
Top loading (± 1) grain	Denver XP600 Denver XL500 Denver XL610	1 (± 0.2) grains 100 (± 1) grains 1000 (± 2) grains

4.3.1 Balances shall be calibrated by an outside vendor annually that is accredited to ISO/IEC 17025 and whose scope of accreditation covers the calibration performed. New balances shall be calibrated prior to being placed into service. Calibration certificates shall be evaluated by the Section Supervisor, Group Supervisor, or designee prior to placing the balance into service.

4.3.2 All balances shall be performance checked quarterly (every three months) for accuracy using Class F or ASTM Class 1 weights.

4.3.2.1 Record weight displayed using the Balance Log.

4.3.2.2 If the accuracy of a weight is outside the acceptable range listed in Table 1, ensure the balance is level and clean prior to rechecking. If, after these actions, the weight check is still outside the acceptable range, the balance shall be taken out of service and labeled as such until maintenance and/or calibration is performed by a qualified vendor.

4.3.2.3 Weights used to check balance accuracy shall be re-certified every three years by an ISO/IEC 17025 accredited vendor whose scope of accreditation covers the certification performed.

4.4 Comparison Microscopes

4.4.1 After installation or maintenance, a performance check shall be conducted on each set of objectives to ensure they are in compliance as follows:

4.4.2 A performance check of the comparison microscopes shall be conducted annually using Klarmann Rulings stage micrometers.

4.4.2.1 Place stage micrometer on each microscope stage ensuring they are in the same plane with each other and lenses are at same magnification.

4.4.2.2 Move stage micrometer until graduation lines correspond.

4.4.2.3 Acceptance Criterion:

4.4.2.3.1 All magnifications of oculars shall be accurate (± the width of graduate line on stage micrometer).

4.4.3 If above accuracy is not observed, the microscope shall be taken out of service and either replaced or repaired by an authorized service vendor.

4.4.4 Klarmann Rulings stage micrometers shall be calibrated by an outside contractor every three years.

4.5 Stereo Microscopes

The following shall be done annually for microscopes equipped with reticles in eyepieces.

4.5.1 Ensure that the reticle has been installed properly in eyepiece so that it is in sharp focus.

4.5.2 Place the Klarmann Rulings stage micrometer on flat horizontal surface in the field of view and ensure that the known standard is in focus.

4.5.3 Using the reticle and stage micrometer, superimpose the 0.1” reticle over 0.1” on the stage micrometer when the magnification control knob on the stereo microscope is at or near “*full scale”*, if possible.

4.5.3.1 Mark the correct position for “*full scale”* measurement on the magnification control knob on the stereo microscope.

4.5.4 Using the reticle and the stage micrometer, superimpose 0.1” reticle over the 0.2” on the stage micrometer when the magnification control knob on the stereo microscope is at or near “half scale”.

4.5.4.1 Mark the correct position for “half scale” measurement on the magnification control knob of the stereo microscope.

4.5.5 Acceptance Criteria

4.5.5.1 All magnifications of reticles shall be accurate (± width of graduate line on stage micrometer).

4.5.5.2 If reticle does not perform to the performance standard or is in need of repair, it shall be taken out of service and either replaced or repaired by an authorized service vendor.

4.5.5.3 Accuracy must be established after installation of a new reticle or when it is put back into service after maintenance/repair.

4.6 Micrometers and Calipers

Accuracy must be established prior to a micrometer or caliper being put into service after purchase, maintenance or repair.

4.6.1 A performance check shall be conducted annually on micrometers and calipers using Klarmann Rulings stage micrometers on a comparison microscope.

4.6.1.1 At the same magnification, place a stage micrometer on one stage and the equipment (micrometer or caliper) to be checked on the other stage.

4.6.1.2 The equipment is considered accurate if it meets the following specifications:

0.1 inch (± width of graduate line on stage micrometer)
0.01 inch (± 0.005 inch)
0.001 inch (± 0.0005 inch)

4.6.2 If a micrometer or caliper does not meet the accuracy listed above or is in need of repair, it shall be taken out of service and either replaced or repaired by an authorized service vendor.

4.7 Rulers and Tape Measures

4.7.1 Accuracy must be established prior to a ruler or tape measure being put into service after purchase, maintenance or repair.

4.7.2 A performance check shall be conducted on rulers and tape measuring devices using the Starrett Certified 100 foot metal tape if visible damage is detected.

4.7.2.1 If the equipment being checked disagrees with the Starrett Certified equipment by greater than ± half of the smallest increment, it shall be removed from service.

4.8 NIBIN System Performance Check

See the NIBIN Section of this manual.

4.9 Reference Collections

4.9.1 Reference collections of data or materials used for the identification, comparison or interpretation shall be fully documented, uniquely identified and properly controlled.

4.9.2 In-house reference collections shall only be generated, edited, or modified by a firearm/toolmark section supervisor or designee.

4.9.3 Specimens of any in-house reference collection shall be uniquely identified by placing an individual identifier/inventory control number either on the specimen itself or on the container/vessel in which it is stored. A listing of all specimens with their identifier shall be maintained in an electronic format along with the documentation of the important characteristics of each.

4.9.4 The documentation of in-house reference collection specimens shall include the characteristics of each specimen which have been established to be important insofar as their application to casework is concerned.

4.9.5 Reference collections within the firearm/toolmark section are properly controlled by limiting the personnel allowed to make changes to the collections and by limiting users to personnel within the firearm/toolmark section.

4.9.6 A list of all firearm/toolmark reference collections and corresponding unique identifiers is maintained and is available to section personnel.

5 REPORT FORMATS

5.1 Introduction

5.1.1 The following report formats shall be used to the extent possible to ensure consistency within the section. It is recognized that report statements cannot be provided to address all situations; therefore, these statements should be considered example wording. The examiner shall consult with Supervisors, the Program Manager and/or the Director of Technical Services for appropriate wording when necessary.

5.1.2 The use of the terms “brand” and “caliber” within report statements is at the discretion of the examiner.

5.1.3 Reports may not use non-specific terms (e.g., “consistent with”, “highly specific”, “similar to”, indicative of”, or “characteristic of”) without additional explanation and/or qualification.

5.1.4 The *underlined italicized* portion in the proposed statements serve as an example, and the intent is to utilize the correct information in the case.

5.1.5 It is acceptable to spell out a number and not follow it with a numerical value in parenthesis.

Example: Two cartridge cases from Item 1 were test fired in Item 3.

5.1.6 The Certificate of Analysis (CoA) shall include the types of examinations that were conducted to reach the stated conclusions.

5.1.7 The following statement shall be included on all reports:

Supporting examination documentation is maintained in the case file. The above listed methods are those approved for use at the time of analysis. Current methods can be found in the Forensic Scientist-NIBIN Procedures Manual, which can be found at www.dfs.virginia.gov/documentationpublications/manuals/ .

5.1.8 If an item (e.g., firearm, magazine, ammunition, holster) is received but not examined, it shall be documented in the body of the report. The below statement is to be utilized to address the known submitted item that was not examined.

No examinations were conducted on *Items 2, 3 and 5*.

5.1.9 Deviations from testing methods shall be included on the CoA.

5.1.9.1 Deviations related to the worksheet history tracking do not need to be included on the CoA.

5.2 Firearm Functioning

It is necessary to state if the submitted magazine or a reference magazine was used for test firing.

It is the discretion of the examiner to use the term “test fired with” or “test fired using”.

5.2.1 Test fired with submitted magazine:

The *Item 5 firearm* was examined, found to be in mechanical operating condition with the safety feature(s) functioning properly and test fired using the submitted magazine.

The *Item 5 firearm* was examined, found to be in mechanical operating condition, and test fired using the submitted magazine.

5.2.2 Test fired with reference magazine:

The *Item 6 firearm* was examined, found to be in mechanical operating condition with the safety feature(s) functioning properly and test fired with a magazine from the laboratory's reference collection.

The *Item 6 firearm* was examined, found to be in mechanical operating condition, and test fired with a magazine from the laboratory's reference collection.

5.2.3 Test fired with no magazine:

Item 6 was examined, found to be in mechanical operating condition with the safety feature(s) functioning properly and test fired.

Item 6 was examined, found to be in mechanical operating condition, and test fired.

5.2.4 Non-Standard Firearms

5.2.4.1 Flintlock

Item 6, a flintlock, smoothbore musket of approximately *62 [caliber]*, has a functioning flintlock mechanism (with flint), a priming pan, and an unobstructed barrel and flashhole. Therefore, it would be expected to fire if properly loaded. *Item 6* is an instrument that was designed and made to expel a projectile by means of an explosion.

5.2.4.2 Replica

Item 6 is a *Japanese* manufactured replica of a *Beretta Model 1934 semiautomatic pistol*. This replica is not capable in its present condition of firing a cartridge containing a projectile.

5.2.4.3 Flare Gun

The *Item 6* flare gun was examined, found to be in mechanical operating condition with the safety feature functioning properly, and test fired.

5.2.4.4 Pellet Guns/Air Guns

The *Item 6* air pistol was examined, found to be in mechanical operating condition with the safety feature functioning properly, and test fired with the submitted magazine.

5.2.4.5 Black Powder/Pyrodex

As received, the *Item 6* rifle was loaded with one 50 caliber sabot/bullet, three 30 grain Pyrodex pellets, and one fired primer, which were removed from the rifle and designated as *Item 6A*. The *Item 6* firearm was examined, found to be in mechanical operating condition with the safety features functioning properly, and test fired.

Two 50 caliber lead bullets, two size #209 shotshell primers, and four Pyrodex pellets from laboratory stock ammunition were used for test firing purposes. The resultant

ammunition components are being returned as Item 6B in container 1 and should be maintained for possible future examinations.

5.2.4.6 Bump stock type device

The *Item 1* firearm has a *Slide-Fire* brand stock. A *Slide-Fire* brand stock is a device that is designed to allow a semiautomatic firearm to shoot more than one shot with a single pull of the trigger by harnessing the recoil energy of the semiautomatic firearm to which it is affixed so that the trigger resets and continues firing without additional physical manipulation of the trigger by the shooter. The device was present, but not tested.

5.2.4.7 Binary trigger

The *Item 1* rifle is equipped with a binary firing system which, when selected, allows the rifle to fire when the trigger is pulled and when the trigger is subsequently released.

5.2.4.8 Machine gun conversion device/Glock switch

Examination of the *Item 1* firearm revealed a (*modification*/*device (i.e., drop-in auto sear or modified slide cover plate)*) which is designed to convert a semi-automatic firearm to full-automatic. The *Item 1* firearm was found to be in mechanical operating condition and test fired using the *Item 2* magazine. The firearm fired in both semi-automatic and full-automatic modes during test firing.

Examination of the *Item 1* firearm revealed a modified slide cover plate, which converts a semi-automatic firearm to full-automatic. The *Item 1* firearm was found to be in mechanical operating condition with the safety features functioning properly, and test fired using the *Item 2* magazine. The firearm fired in both semi-automatic and full-automatic modes during test firing.

5.3 Test Fires/Tests and Disposition (NIBIN and Comparison)

It is necessary to state on the CoA if the ammunition used for testing purposes (test fires) was submitted, obtained from laboratory stock or a combination.

It is necessary to specify the number of bullets and cartridge cases being returned when a bullet or cartridge case intended for return could not be recovered.

It is necessary to state on the CoA in which container the test fires/tests are being returned.

5.3.1 Submitted evidence ammunition:

Five of the *Item 6 cartridges* were used for test firing purposes. The resultant ammunition components are being returned in container *2* and should be maintained for possible future examinations.

5.3.2 Laboratory stock ammunition:

Three cartridges from laboratory stock ammunition were used for test firing purposes. The resultant ammunition components are being returned as *Item 5A* in container *1* and should be maintained for possible future examinations.

5.3.3 Ammunition (to be used in instance when a bullet or cartridge case intended for return as a sub-item could not be recovered**):**

Three cartridges from laboratory stock ammunition were used for test firing purposes. Three cartridge cases and two bullets are being returned as *Item 5T* in container *1* and should be maintained for possible future examinations.

Three of the *Item 6 cartridges* were used for test firing purposes. Three cartridge cases and two bullets are being returned in container *1* and should be maintained for possible future examinations.

5.3.4 Return of found test fired bullet or cartridge case

One *bullet* from previously test firing *Item 5* is being returned and will not be used for any future examinations.

5.3.5 Submitted evidence and laboratory stock ammunition:

Two cartridges from laboratory stock ammunition and *two* of the *Item 3* cartridges were used for test firing purposes. The resultant ammunition components from laboratory stock ammunition are being returned as Item 3T. These test fired ammunition components are being returned in Container *7* and should be maintained for possible future examinations.

5.4 Non-Functioning Firearm/Instrument

5.4.1 *Item 1* was examined and found not to be in mechanical operating condition due to a *missing firing pin*. Using replacement parts from the laboratory reference collection, *Item 1* was test fired with the *submitted magazine*.

5.4.2 *Item 1* was examined and found not to be in mechanical operating condition. Using a replacement frame from the laboratory reference collection, *Item 1* was test fired with the *submitted magazine*.

5.4.3 *Item 1* was examined and found not to be in mechanical operating condition due to *corrosion*. After *cleaning and oiling*, *Item 1* was test fired with the *submitted magazine*.

5.4.4 *Item 1* was examined and found not to be in mechanical operating condition. Attempts to repair *Item 1* were unsuccessful; therefore, it was not test fired.

5.4.5 *Item 1* is not designed, nor can it be readily converted, to expel a projectile by the action of an explosion of a combustible material.

5.4.6 Examination of *Item 1* revealed it was not in mechanical operating condition due to a *missing firing pin*. Using replacement parts from the laboratory reference collection *Item 1* was test fired with the *submitted magazine*.

5.5 Magazine/Firearm Capacity

5.5.1 The capacity of the *Item 1* magazine was determined to be *ten cartridges.*

5.5.2 When fully loaded, the *Item 1* firearm is capable of containing *twelve cartridges*.

5.6 Firearm Parts

Item 1 is consistent in design and all discernible physical characteristics with a magazine *from a U.S. Government Model 1911/1911 A1 semiautomatic pistol or one of the numerous commercial variations chambered to fire the 45 Auto cartridge*.

5.7 Cartridges/Shotshells

5.7.1 No examinations were conducted on the *Item 1* cartridges.

5.7.2 Type for use:

5.7.2.1 *Item 1* was examined and found to be the type designed for use with *Item 2*.

5.7.2.2 *Item 1* was examined and consists of *five Remington and six Winchester 38 Special cartridges*, which are the type for use with *Item 2*.

5.7.2.3 Examination revealed that the *Item 4* cartridges, *two Winchester* and *two Tulammo 9mm Luger* cartridges, are a type for use with the *Item 4 pistol*.

5.7.3 Cartridge examination:

5.7.3.1 *Item 1* was disassembled for examination purposes and was found to contain a cartridge case, bullet, primer and propellant component. *The resultant primed cartridge case was test fired*.

5.7.3.2 *Item 2* contains *thirty-one 40 Smith & Wesson* cartridges. *Item 3* contains *ten Federal 7.62 x 39mm cartridges, fifteen Speer 9mm Luger* cartridges and three *40 Smith & Wesson* cartridges. One of each type of cartridge was disassembled for examination purposes. Each of the disassembled cartridges was found to contain a cartridge case, bullet, primer, and propellant component.

5.8 NIBIN

The below Entry and Association are to be used in conjunction as applicable.

5.8.1 Entry

5.8.1.1 A cartridge case from test firing *Item 1* was entered into the NIBIN system and a search was conducted.

5.8.1.2 The *Item 1T1* cartridge case was entered into the NIBIN system and a search was conducted.

5.8.1.3 A NIBIN search was not conducted on *Item 4* because *revolver* type cartridge cases are not entered in the database.

5.8.1.4 A cartridge case from test firing the *Item 6* firearm was not entered into NIBIN due to the lack of sufficient suitable markings.

5.8.2 Associations

5.8.2.1 No associations were made at this time; however, searches will be conducted periodically as new images are entered into the database.

5.8.2.2 A potential association exists between the *Item 1* firearm and the *Item 7* cartridge case submitted under FS Lab # *15-xxxx* (*Hampton PD #14-zzzz*). Please contact the examiner listed below for assistance in facilitating the resubmission of evidence if confirmation of this potential association is necessary.

5.8.2.3 A potential association exists between the a cartridge case test fired in the *Item 1* firearm and the Item 7 cartridge case submitted under FS Lab # 15-xxxx (Hampton PD #14-zzzz). Please contact the examiner listed below for assistance in facilitating the resubmission of evidence if confirmation of this potential association is necessary.

Appendix A - Abbreviations

The following is a list of the abbreviations/annotations/acronyms commonly used by examiners in the Firearm/Toolmark Section. This list has been generated to assist in the interpretation of examination documentation and is not a standardized list of required abbreviations. Abbreviations are not case specific and may include punctuation.

_GA	**number of Gauge**
_L	**number of lands/grooves (left twist)**
_R	**number of lands/grooves (right twist)**
A	**Arcs, Automatic, Aluminum (plain)**
AMMO	**Ammunition**
AUTO	**Automatic**
B	**Brown**
BBL	**Barrel**
BCL	**coated lead (brass)**
BEB	**Brass-enclosed base**
BF	**Breech Face**
BFI	**Breech Face Impression**
BFM	**Breech Face marks**
BPB	**Brown paper bag**
BPWP	**Brown paper wrapped package**
BR	**Brass, Breech**
BT	**Boattail**
BUL	**Bullet**
BX	**Box**
C	**Concentric circles/spirals around, Circular (flat base), Circular, Carbine, circumference**
CAL	**Caliber**
CANN	**Cannelure**
CAP	**Capacity**
CC	**Cartridge case**
CCL	**coated lead (copper)**
CHAR, CHARS	**Characteristic/Characteristics**

CHM	**Chamber Marks, chamber**
CON	**conical shaped concave recess**
CONT, C	**Container**
CART(S)	**Cartidges(s)**
CTG'S	**Cartridge(s)**
CW	**Concealed Weapon**
CYL	**cylindrical-concave recess in base, cylinder**
D	**Diameter, Derringer, Drag mark out of firing pin impression, Double**
DA	**Double-action**
DAO	**Double-action only**
DIFF	**Difference or different**
DPA	**deep parabolic concave recess**
E, ELLIP	**elliptical (Glock/SWD)**
EA	**Each**
EJT	**Ejector**
EN, ENV	**Envelope**
ER	**Evidence Receiving**
EVID	**Evidence**
EXT	**Extractor, Exit**
FA	**Firearm**
FLT	**flat base (no recess in base)**
FMC	**Full metal case**
FMJ	**Full metal jacket, or full patch**
FNJ	**Flat-nose jacketed**
FP	**Fingerprint, Firing Pin**
FPA	**Firing Pin Aperture**
FPIN	**Firing Pin**
FPAS	**Firing Pin Aperture Shear**
FPI	**Firing Pin Impression**
FRAG	**Fragment**
FSR	**flat base with recess, step like RP**
G	**gas or air, Granular, Steel (gray color finish)**
GC	**gas check**

GD	**Gold dot**
GEA	**Groove Impression**
GIMP	**Groove Impression**
GMB	**Glock Marking/Marksman Barrel**
GR(S)	**Grain(s)**
GRC	**General rifling characteristics**
GRIP S	**Grip Safety**
H	**Hemispherical**
HEM	**Hemispherical**
HP	**Hollow Point, hollow point (non-jacketed bullet)**
HSHP , HS	**Hydra-Shok hollow point**
I	**Independence, semiautomatic, Incendiary, Item**
I/S	**Inside**
ID	**Inside Diameter,**
IMP	**Impression**
IND	**Indicator, Individual**
J	**jacket/jacketed**
JS	**jacketed; base solid**
JSP	**jacketed/Semi-jacketed soft point**
K	**Knurled, Kidney Shaped,**
L	**Left, Long, Lever action, Left-Slant (Rectangular, Chisel), lead**
L/S	**Left side**
LAG	**Land and groove**
LB	**Lock box**
LCI	**Loaded Chamber Indicator**
LEA	**Land Impression**
LIMP	**Land Impression**
LR	**Long Rifle, Left Side Rail**
LRN	**Lead round nose**
LSR	**left side of receiver**
LSS	**left side of slide**

LSW	**lead (swaged)**
L-SWC	**Lead semi-wadcutter**
M	**Manilla**
MAG	**Magnum, Magazine**
MEN	**Manila envelope**
MFR	**Manufacturer**
MLM	**Magazine Lip Marks**
MOD	**Model, Modification**
MPA	**medium parabolic-shaped concave recess**
NEG	**Negative**
O	**Other, irregular**
OAL	**Overall length**
OB	**lead, solid, jacketed: base open**
P	**pump (Slide Action), pistol (handgun), parallel (any direction), all plastic exterior, polygonal, Parabellum**
PAR	**Parallel (any direction)**
PARA	**Parabellum (example: 9mmP)**
PB	**Paper bag**
PAB	**Paper bag**
PKG	**Package**
PLB	**Plastic bag**
POLY	**Polygonal**
PT	**Pointed (conical or spitzer)**
R	**Right, Rectangular, Rifle, Revolver**
RECT	**Rectangular**
R/S	**Right side**
REF	**Reference**
REP	**Representative**
RESP	**Respectively**
RF	**Rimfire**
RFD	**Remote Firing Device**
RN	**Round Nosed**
ROR	**rear of receiver**
RSR	**right side of receiver**
RSS	**right side of slide**

S	**Smooth (no traces), smooth, Short, Sealed, Single shot, Shotgun, Semi-Circular, Steel (copper colored finish)**
S, C	**standard (conventional) lands and grooves**
S/STEEL	**Stainless Steel**
SA	**Single action**
SJ	**Semi-jacket**
SER NO	**Serial number**
SN	**Serial number**
SOL	**solid**
SP	**Soft Point**
SPA	**shallow parabolic recess**
SPL	**Special**
ST	**Silvertip, steel, steel jacketed**
STL	**steel jacketed (plated or unplated)**
SUB	**Submission, submitted**
SWBX	**Sealed white box**
SWC	**Semi-wadcutter**
TC	**Truncated cone**
TE	**Trace Evidence**
TF	**Test fire**
TG	**trigger guard**
T/Guard	**trigger guard**
TM	**Toolmark**
TMJ	**Total metal jacket**
TSJ	**Total synthetic jacket**
U	**U-Shaped**
U/S	**Underside**
UK	**Unknown**
USR	**underside frame, front of trigger**
VIS	**Visible**
W	**White, Wedge**
WC	**wadcutter**
WKST	**Worksheet**
WPWP	**White paper wrapped package**
X	**Cross-hatched**

Y	**Yellow**
YEN	**Yellow envelope**