



## **Toolmarks Examination Test No. 21-5281 Summary Report**

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Each sample set contained three known reloaded cartridges (Item 1) and two reloaded cartridges containing questioned toolmarks (Items 2 and 3). Participants were requested to examine these items and report their findings. Data were returned from 122 participants and are compiled into the following tables:

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This report contains the data received from the participants in this test. Since these participants are located in many countries around the world, and it is their option how the samples are to be used (e.g., training exercise, known or blind proficiency testing, research and development of new techniques, etc.), the results compiled in the Summary Report are not intended to be an overview of the quality of work performed in the profession and cannot be interpreted as such. The Summary Comments are included for the benefit of participants to assist with maintaining or enhancing the quality of their results. These comments are not intended to reflect the general state of the art within the profession.

Participant results are reported using a randomly assigned "WebCode". This code maintains participant's anonymity, provides linking of the various report sections, and will change with every report.

# Manufacturer's Information

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Each sample set contained four items: Item 1 consisted of three reloaded cartridges recovered from the suspect's residence. Items 2 and 3 each consisted of one reloaded cartridge recovered from the scene. Starline 9mm brass 124 grain Berrys Bullets ammunition was used for all five items and created using a Dillon 550 Progressive Press and two sets of 9mm dies with a carbide factory crimp. Participants were requested to determine which, if any, of the recovered questioned reloaded cartridges (Items 2 and 3) were produced from the same reloading die as the known reloaded cartridges recovered from the suspect's residence (Item 1).

The reloaded cartridges in Items 1 and 3 were created using the same 9mm die and Item 2 was created using a different 9mm die than the one that created Items 1 and 3.

ITEMS 1 and 3 (IDENTIFICATION): Bullets were seated into new factory cartridge cases using a Dillon 550 Progressive Press and a 9mm die. Once complete, the reloaded cartridges were placed in a tray. This process was repeated until the required number was produced. The necessary number of reloaded cartridges were inscribed with a "1" (three cartridges) and a "3" (one cartridge), then sealed into their respective envelopes.

ITEM 2 (ELIMINATION): Bullets were seated into new factory cartridge cases using a Dillon 550 Progressive Press and a different 9mm die than the one used for the Identification production. Once complete, the reloaded cartridges were placed in a tray. This process was repeated until the required number was produced. The necessary number of reloaded cartridges were inscribed with a "2" (one cartridge), then sealed into their respective envelopes.

SAMPLE SET ASSEMBLY: For each sample set, Items 1, 2, and 3 were placed in a sample pack box. This process was repeated until all of the sample sets were prepared. The sample packs were sealed with evidence tape and initialed "CTS."

VERIFICATION: During test production, every tenth reloaded cartridge was selected and intercompared to confirm that markings were consistent and identifiable to the first reloaded cartridge case. Additionally, the predistribution results were consistent with the expected responses.

## **Summary Comments**

This test was designed to allow participants to assess their proficiency at a toolmark examination involving striated toolmarks. Each sample set consisted of three reloaded cartridges (Item 1) and two reloaded cartridges (Items 2 and 3) containing the questioned toolmarks. Participants were requested to determine if either of the questioned reloaded cartridges (Items 2 and 3) were produced from the same reloading die as the reloaded cartridges (Item 1). (Refer to Manufacturer's Information for preparation details.)

Of the 122 responding participants, 114 (93%) identified Item 3 and either eliminated (57) or were inconclusive (57) for Item 2 as having been created with the same 9mm die as the one that created Item 1. Four participants either eliminated or were inconclusive for both Items 2 and 3, three participants identified both Items 2 and 3, and one participant identified Item 2 and was inconclusive for Item 3 as having been created with the same 9mm die as the one that created Item 1.

Some participants stated that as a matter of policy, a conclusion cannot be determined without access to the tool or when class characteristics match. Thus, responses of inconclusive are not indicated as outliers for this test in regard to Items 2 and 3.

## Examination Results

*Were any of the questioned reloaded cartridges (Items 2, 3) produced using the same reloading die as the reloaded cartridges recovered from the suspect's residence (Item 1)?*

TABLE 1

| WebCode | Item 2 | Item 3 | WebCode | Item 2 | Item 3 |
|---------|--------|--------|---------|--------|--------|
| 2QZ63N  | No     | Yes    | 9CD94D  | No     | Yes    |
| 2W8FFP  | No     | Yes    | 9FCJZD  | No     | Yes    |
| 2ZLBZT  | No     | Yes    | 9G92X9  | Inc    | Yes    |
| 38ZEML  | No     | Yes    | 9N9GKV  | Yes    | Inc    |
| 3BHGPK  | Inc    | Yes    | 9P2AKK  | No     | Yes    |
| 3PJ9BP  | No     | Yes    | 9R63EJ  | No     | Yes    |
| 3W2LAN  | No     | Yes    | 9XTNJJ  | Inc    | Yes    |
| 4CQBKB  | Inc    | Yes    | A82K4G  | No     | Yes    |
| 4FPMHW  | Inc    | Yes    | ABFEJE  | No     | Yes    |
| 4GHFDE  | Inc    | Yes    | AD7HCL  | Inc    | Yes    |
| 4Y6WKH  | No     | Yes    | AGPF2B  | Inc    | Yes    |
| 6JTH4K  | Inc    | Yes    | AMD3VG  | No     | Yes    |
| 6LUKPF  | Inc    | Yes    | AXCTGN  | No     | Yes    |
| 6URDYU  | No     | Yes    | B94YPD  | No     | Yes    |
| 73YC9V  | Inc    | Yes    | BJP4VR  | No     | Yes    |
| 789RDD  | No     | Yes    | BK4AG9  | Inc    | Yes    |
| 7DY3NC  | Inc    | Yes    | BLEERC  | Inc    | Yes    |
| 8P832G  | No     | Yes    | BQNTEG  | Inc    | Yes    |
| 8W43DN  | Inc    | Yes    |         |        |        |

TABLE 1

| WebCode | Item 2 | Item 3 | WebCode | Item 2 | Item 3 |
|---------|--------|--------|---------|--------|--------|
| BRFN2P  | Inc    | Yes    | GA3VZH  | No     | Yes    |
| BRGLAZ  | Inc    | Yes    | GBDZAZ  | No     | Yes    |
| CGDQTF  | No     | Yes    | GDKDV9  | No     | Yes    |
| CJ6P39  | Inc    | No     | GPWKVE  | No     | Yes    |
| CQ4EJC  | Inc    | Yes    | GR2DL8  | No     | Yes    |
| CWQ2G3  | Inc    | Yes    | GRKWW7  | Inc    | Yes    |
| D468TZ  | Inc    | Yes    | GRZDPD  | Inc    | Yes    |
| D64BJP  | No     | Yes    | GTU7KW  | Inc    | Yes    |
| D86BL9  | Inc    | Yes    | GXPV24  | Inc    | Yes    |
| DMY36N  | Inc    | Yes    | HETRZT  | No     | Yes    |
| DWNR3C  | No     | Yes    | HHNJ76  | Inc    | Yes    |
| E77RT6  | Inc    | Yes    | HPPV4M  | Inc    | Yes    |
| EP6MQ3  | Inc    | Yes    | HVDDL6  | No     | Yes    |
| F7N2JL  | Inc    | Yes    | J6X78Z  | Inc    | Yes    |
| FAJRQW  | No     | Yes    | JNCKPV  | No     | Yes    |
| FCQ82A  | Inc    | Yes    | JUFPET  | Inc    | Yes    |
| FRQRYZ  | Inc    | Yes    | JVC348  | No     | Yes    |
| FTWAYG  | No     | Yes    | K6FFZ2  | Inc    | Yes    |
| FY37JG  | No     | Yes    | KE64V4  | No     | Yes    |
| G2P7X4  | No     | Yes    | KHGDJR  | No     | Yes    |

TABLE 1

| WebCode | Item 2 | Item 3 | WebCode | Item 2 | Item 3 |
|---------|--------|--------|---------|--------|--------|
| KJFGBG  | Yes    | Yes    | RV7HUB  | Inc    | Yes    |
| KKA349  | No     | Yes    | T6ATZZ  | No     | Yes    |
| L69P99  | Inc    | Yes    | T6LRTN  | Inc    | Yes    |
| L99ZZ3  | Inc    | Yes    | TK4HWW  | No     | Yes    |
| LBDNGD  | Yes    | Yes    | TYGTJJ  | No     | Yes    |
| LG42GF  | Inc    | Yes    | U9PKP8  | Inc    | Yes    |
| LK48X8  | Inc    | Yes    | UKWXGT  | Inc    | Yes    |
| M4BYFY  | No     | Yes    | V6GWMM  | No     | Yes    |
| MKJT89  | No     | Yes    | V6ZX86  | No     | Yes    |
| MNHAFW  | Inc    | Yes    | VNAUMU  | Inc    | Yes    |
| MX7Z3N  | Inc    | Yes    | W4ML6T  | No     | Yes    |
| MXTB2X  | Inc    | Yes    | W6DPXZ  | No     | Yes    |
| NRUC3R  | Inc    | Inc    | WE3DT3  | No     | Yes    |
| PUELPY  | Inc    | Yes    | WFECLQ  | Inc    | Yes    |
| PWA7HP  | No     | Yes    | WH4JAU  | No     | Yes    |
| QNPMBV  | Inc    | Yes    | X8ZNQP  | Inc    | Yes    |
| QTHPGF  | No     | Yes    | XBEKU6  | Inc    | Yes    |
| QWG3ZY  | No     | Yes    | XG6V7P  | Inc    | Yes    |
| QYAWZP  | No     | Inc    | XJT84A  | No     | Inc    |
| QZ2TQ4  | No     | Yes    | XQBHEP  | Inc    | Yes    |

TABLE 1

| WebCode | Item 2                       | Item 3 | WebCode | Item 2 | Item 3 |
|---------|------------------------------|--------|---------|--------|--------|
| XQD6V3  | No                           | Yes    |         |        |        |
| XXCWZQ  | No                           | Yes    |         |        |        |
| YAYLBF  | Inc                          | Yes    |         |        |        |
| YQ98XC  | No                           | Yes    |         |        |        |
| ZJK7V6  | <input type="checkbox"/> Yes | Yes    |         |        |        |

| Response Summary  |     |                   | Total Participants: 122 |                    |
|---|-----|-------------------|-------------------------|--------------------|
| <p><i>Were any of the questioned reloaded cartridges (Items 2, 3) produced using the same reloading die as the reloaded cartridges recovered from the suspect's residence (Item 1)?</i></p> |     |                   |                         |                    |
| <b>Responses</b>  |     | <u>ITEM 2</u>     |                         | <u>ITEM 3</u>      |
|   | Yes | <b>4</b> (3.3%)   |                         | <b>117</b> (95.9%) |
|   | No  | <b>59</b> (48.4%) |                         | <b>1</b> (0.8%)    |
|   | Inc | <b>59</b> (48.4%) |                         | <b>4</b> (3.3%)    |

# Conclusions

## TABLE 2

| WebCode | Conclusions  |
|---------|--|
| 2QZ63N  | Item 1 & Item 2 have same length, but they have different scratch and weight. Item 1 & Item 3 have same length, scratch and weight. (scratch means its number and shape) Therefore, Item 1 & Item 2: Disaccordance. Item 1 & Item 3: Accordance.   |
| 2W8FFP  | Item 2 was not produced using the same reloading die as Item 1. Item 3 was produced using the same reloading die as Item 1.  |
| 2ZLBZT  | [No Conclusions Reported.]   |
| 38ZEML  | (1.1): These reloaded unprimed cartridges (knowns) from the suspect's residence were microscopically examined and determined to be suitable for comparison. They were compared microscopically with Items 1.2 and 1.3. (1.2 and 1.3) These reloaded unprimed cartridges were microscopically examined and determined to be suitable for comparison. The reloading marks present on Items 1.2 and 1.3 have been examined and compared microscopically with each other and the submitted knowns, Item 1.1. Based on the observed agreement of their class characteristics and sufficient agreement of their individual characteristics, the reloading marks present on Item 1.3 are identified as having been made by the same reloading die that created the marks on Item 1.1. Based on the difference in individual characteristics the reloading marks on Item 1.2 were not made by the same die that made the marks on Item 1.1 and Item 1.3. Item 1.2 was created using a different reloading die. |
| 3BHGPK  | The toolmarks present on the partially reloaded cartridges, Items 01-01 (renamed 1a, 1b, and 1c) were made by the same reloading die(s). The toolmarks on Item 01-02 could not be identified or eliminated as having been made by the same reloading die(s) as the toolmarks on Items 01-01 (1a, 1b, and 1c) due to a similarity in class characteristics and a lack of matching individual characteristics. The toolmarks on Item 01-03 were made by the same reloading die(s) as the toolmarks on Item 01-01 (1a, 1b, and 1c).   |
| 3PJ9BP  | [No Conclusions Reported.]   |
| 3W2LAN  | 1: Examinations showed the tool marks on Item 3 were made by the same tool as Item 1. 2: Examinations showed the tool marks on Item 2 were not made by the same tool as Item 1.  |
| 4CQBKB  | Tool Mark Analysis: Methodology: Physical (Visual Examination) Microscopy (Comparison Microscope). The tool mark on Item 3, the unfired cartridge, was made with the same tool as Items 1A, 1B, and 1C, identified as the unfired cartridges from known source, based upon corresponding class and individual microscopic characteristics. Comparisons between the tool mark on Item 2, the unfired cartridge, and test marks made on Items 1A, 1B, 1C, identified as the unfired cartridges from known source, were inconclusive due to insufficient class and individual microscopic characteristics. Comparisons between the tool mark on Item 2, the unfired cartridge, and tool marks made on Item 3, the unfired cartridge, were inconclusive due to insufficient class and individual microscopic characteristics.  |
| 4FPMHW  | In my opinion, the second reloaded cartridge (Item 3) recovered from the scene of the armed robbery has been produced using the same reloading die that was used to produce the reloaded cartridges (Item 1) recovered from the home address of the suspect. It is in my opinion unlikely that the first reloaded cartridge (Item 2) was produced with the same reloading die that I consider was used to produce the other reloaded cartridges considered in this matter.   |
| 4GHFDE  | The following items were visually examined and microscopically compared: Exhibit 1: Three (3) cartridges. Exhibit 2: One (1) cartridge. Exhibit 3: One (1) cartridge. 1: Visual and microscopic examination of Exhibits 1, 2, and 3 revealed that the cartridges were unfired and that they did not contain gunpowder or a primer. The Exhibits 1, 2, and 3 cartridges exhibited fine striations near the mouth of the cartridge case and the bullet bearing surface that were typical of marks made by a reloading die. The three cartridges in Exhibit 1 were microscopically compared to each other and to the Exhibit 2 and 3 cartridges. 2: Due to agreement of all discernible class characteristics but insufficient agreement of individual characteristics, it could not be determined whether the reloading  |



## TABLE 2

| WebCode | Conclusions  |
|---------|--|
|         | die marked that marked all three Exhibit 1 cartridges was also used to load or mark the Exhibit 2 cartridge. 3: Agreement of all discernible class characteristics and individual characteristics was sufficient to determine that the same reloading die that marked all three Exhibit 1 cartridges was also used to mark the Exhibit 3 cartridge. Technical Notes: Class characteristics are defined as measurable features of a firearm/tool which indicate a restricted group source. They result from design features and are determined prior to manufacture of the firearm/tool. Individual characteristics are defined as marks produced by the random imperfections or irregularities of firearm/tool surfaces. These random imperfections or irregularities are produced incidental to manufacture and/or caused by use, corrosion, or damage, and are unique to that specific tool. Any conclusions indicating that a toolmark was made by a specific firearm/tool are not to the absolute exclusion of all other firearms/tools because it is not feasible to examine all possible firearms/tools. However, observing this amount of agreement from a different source is considered extremely remote.   |
| 4Y6WKH  | Based on agreement of class characteristics and sufficient agreement of individual characteristics, Item 3 was produced using the same reloading die as the three known reloaded cartridges recovered from the suspect's residence in Item 1. Based on significant disagreement of individual characteristics, Item 2 was not produced using the same reloading die as the three known reloaded cartridges recovered from the suspect's residence in Item 1.   |
| 6JTH4K  | Item 1C (CTS #3) was identified as having been marked by the same tool that marked item 1A (CTS #1 test cartridges) based on the agreement of class and individual observed on marked the surface. Item 1B (CTS #2) could not be identified or eliminated as having been marked by the same tool that marked item 1A (CTS #1 test cartridges) based on the lack of agreement of individual characteristics observed on marked the surfaces; However, all class characteristics were in agreement.  |
| 6LUKPF  | 1: It was concluded that the same tool caused the damage on Exhibit 1 and 3 based on an agreement of class characteristics and a sufficient agreement of individual characteristics. 2: Microscopic comparison of the toolmarks found on Exhibits 1 and 2 revealed that they could not be identified or eliminated as having been made by the same tool.   |
| 6URDYU  | after comparing item number (1) with item number (3 ), we found a similarities in microscopic marks in both items: no seemlier microscopic marks were found between item (1) and item (2).   |
| 73YC9V  | Toolmarks present on the Item 1 and Item 3 reloaded cartridges were identified as having been produced by the same tool. A pattern examination of toolmarks present on the Item 2 reloaded cartridge was inconclusive to those on the Item 1 and Item 3 reloaded cartridges due to a lack of sufficient corresponding microscopic marks of value.  |
| 789RDD  | 1: Examination of Exhibit 1 revealed three (3) unfired cartridges, 9mm Luger with a Starline marketed case. None of the cartridges contain powder or a primer. All cartridges have the presence of toolmarks consistent with being reloaded. 2: Examination of Exhibit 2 revealed one (1) unfired cartridge, 9mm Luger with a Starline marketed case. The cartridge does not contain powder or a primer and has toolmarks present that are consistent with being reloaded. 3: Examination of Exhibit 3 revealed one (1) unfired cartridge, 9mm Luger with a Starline marketed case. The cartridge does not contain powder or a primer and has toolmarks present that are consistent with being reloaded. 4: Microscopic comparison of Exhibit 1 and Exhibit 2 revealed that Exhibit 2 was not reloaded by the same tool as Exhibit 1 based on an agreement of class characteristics and a sufficient disagreement of individual characteristics within the toolmarks around the mouth of the cartridge case and the surface of the bullet. Observing this amount of disagreement from the same source is considered extremely remote. 5: Microscopic comparison of Exhibit 1 and Exhibit 3 revealed that Exhibit 3 was reloaded by the same tool as Exhibit 1 based on an agreement of class characteristics and a sufficient agreement of individual characteristics within the toolmarks around the mouth of the cartridge case and the surface of the bullet. |
| 7DY3NC  | Item 1.1 consists of three Starline brand 9mm Luger +P cartridges. Item 1.2 is one Starline brand 9mm Luger cartridge. It was microscopically compared to the cartridges from Item 1.1. Based on agreement of all discernible class characteristics but a lack of corresponding individual detail in the reloading die marks, Item 1.2 could neither be identified nor eliminated as having been reloaded with   |

## TABLE 2

| WebCode | Conclusions  |
|---------|--|
|         | the same reloading die as the cartridges from Item 1.1. Item 1.3 is one Starline brand 9mm Luger +P cartridge. It was microscopically compared to the cartridges from Item 1.1. Based on agreement of all discernible class characteristics and corresponding individual detail in the reloading die marks, Item 1.3 was identified as having been reloaded with the same reloading die as the cartridges from Item 1.1.   |
| 8P832G  | Hypothesis H1: The reloaded cartridge is reloaded by the same setup as the reloaded cartridges [1] found at the suspect's home. Hypothesis H2: The reloaded cartridge is reloaded by another setup as the reloaded cartridges [1] found at the suspect's home. The results of the comparison of cartridge [3] are extremely more probable when hypothesis H1 is true, then when hypothesis H2 is true. The results of the comparison of cartridge [2] are slightly more probable when hypothesis H2 is true, then when hypothesis H1 is true. The term 'extremely more probable' is part of a standard verbal scale (see below). This scale is used when the scientist has no or insufficient numerical data to explicitly substantiate a numerical conclusion. The selection of the specific verbal term is based on expert knowledge, experience in research and casework, etc. To promote the transparency for the reader and the uniformity among the different experts our institute has defined the verbal terms numerically. These definitions are expressed in orders of magnitude and are listed below. For example, the term 'slightly more probable' means that the probability of observing the results of the investigation is 2 to 10 times larger when one hypothesis is true than when the other hypothesis is true. Verbal equivalent: Order of magnitude of evidential strength approximately equally probable: 1-2 slightly more probable: 2-10 more probable: 10-100 appreciably more probable: 100-10.000 far more probable: 10.000-1.000.000 extremely more probable: >1.000.000 The conclusion expresses the evidential strength of the results regarding the hypotheses. The conclusion does not represent the probability that a particular hypothesis is true. That probability depends on other evidence and information outside the domain of forensic expertise and falls outside the scope of this report. |
| 8W43DN  | Microscopic examination and comparison of the reloaded cartridges, Items #1 through #3, revealed the following: Item #3 possessed the same class characteristics as well as sufficient agreement of individual markings to all elements of Item #1 to determine that Item #3 was produced using the same reloading die as the reloaded cartridges in Item #1. Item #2 did not possess sufficient individual markings to render an elimination or identification from Item #1 and was determined to be inconclusive.  |
| 9CD94D  | The Item 3 questioned cartridge was identified as having been produced by the same reloading die that produced two of the reloaded cartridges in Item 1. The Item 2 questioned cartridge was excluded as having been produced by the same reloading die that produced two of the reloaded cartridges in Item 1.  |
| 9FCJZD  | Utilizing stereomicroscopic examination, it was determined that Items 2 and 3 each exhibit partial tool mark impressions of value for comparison. Item 2 was microscopically compared to the known reloaded cartridges in Item 1. It was determined that the partial tool mark impressions on Item 2 were not made by the same tool as the partial tool mark impressions on Item 1. Item 3 was microscopically compared to the known reloaded cartridges in Item 1. It was determined that the partial tool mark impressions on Items 3 were made by the same tool as the partial tool mark impressions on Item 1.   |
| 9G92X9  | Item 3 was microscopically identified as having been "reloaded" using the same reloading die used to make the standard tests of Item 1. Item 2 could not be microscopically identified or eliminated as having been "reloaded" by the same reloading die used the reload standards of Item 1 due to the lack of sufficient discernable reproducible individual characteristics.  |
| 9N9GKV  | Microscopic examination of K1 (item 001) compared to Q1 (item 002) disclosed consistent class characteristics and sufficient agreement of individual characteristics and therefore were determined to be used by the same reloading die as the known cartridges (K1). Microscopic examination of K1 (item 001) compared to Q2 (item 003) disclosed consistent class characteristics; however insufficient agreement/disagreement of individual characteristics and therefore could not be determined whether or not Q2 was used with the same reloading die as the known cartridges (K1).  |
| 9P2AKK  | [No Conclusions Reported.]   |

## TABLE 2

| WebCode | Conclusions  |
|---------|--|
| 9R63EJ  | The same reloading die was used to cause the reloading marks on the reloaded cartridges, Item 1 and the reloaded cartridge, Item 3. The reloaded cartridge, Item 2 was not reloaded with the same reloading die.   |
| 9XTNJJ  | Item 3 unfired cartridge was reloaded using the same resizing die and bullet crimp as that used to reload Item 1 unfired cartridges. Item 2 can neither be eliminated nor identified as having been reloaded by the same reloading equipment as that used to reload Items 1 and 3 due to some similarities and some dissimilarities in the individual characteristics present from reloading.  |
| A82K4G  | [No Conclusions Reported.]   |
| ABFEJE  | Item 3 was produced using the same reloading die as the reloaded cartridges recovered from the suspect's residence, Item 1 (Identification). Item 2 was produced using different reloading die (Negative).   |
| AD7HCL  | Microscopic examination and comparison of the reloaded cartridges in Item #2 and #3 were compared to the reference reloaded cartridges in Item #1, which revealed the following results: Item #3 possessed similar class characteristics, as well as, sufficient reproducing individual markings as the reference reloaded cartridges in Item #1 and was determined to have been reloaded using the same reloading die as Item #1. Item #2 did not possess sufficient reproducing individual markings to determine an identification, or elimination as to having been reloaded using the same reloading die as Items #1 and #2 and was determined to be inconclusive.   |
| AGPF2B  | 1: Exhibit 1 consisted of three 9mm +P Luger cartridges with cartridge cases produced by Starline. The cartridges contained no primers. 2: Exhibit 2 consisted of one 9mm Luger cartridge with a cartridge case produced by Starline. The cartridge contained no primer. 3: Exhibit 3 consisted of one 9mm +P Luger cartridge with a cartridge case produced by Starline. The cartridge contained no primer. 4: Toolmarks from Exhibit 1 (cartridges) were microscopically examined and compared to toolmarks from Exhibits 2 (cartridge) and 3 (cartridge). 5: An agreement of class characteristics was observed between Exhibit 1 and Exhibit 2. However, due to an insufficient agreement of individual characteristics, it could not be determined if the toolmarks on Exhibit 1 and Exhibit 2 were made by the same tool. 6: An agreement of class characteristics and a sufficient agreement of individual characteristics were observed between Exhibit 1 and Exhibit 3. Thus, it was concluded that Exhibit 1 and Exhibit 3 were marked by the same tool. |
| AMD3VG  | 1): Examinations showed Item 3 was reloaded using the same reloading die used to reload those Items represented in Item 1. 2): Examinations showed Item 2 was not reloaded using the same reloading die used to reload those Items represented in Item 1.  |
| AXCTGN  | First reloaded cartridge recovered from the scene (item 2) was not produced using the same reloading die as the reloaded cartridges recovered from suspect`s residence (item 1). Second reloaded cartridge recovered from the scene (item 3) was produced using the same reloading die as the reloaded cartridges recovered from suspect`s residence item 1).  |
| B94YPD  | Items 1 and 3 reloaded cartridges were produced using the same reloading die. Item 2 reloaded cartridge was produced using a different reloading die than the reloading die used to produce Items 1 and 3 reloaded cartridges.   |
| BJP4VR  | 1: Due to the absence of correspondence between their microscopic marks on base of the bullet and upper part of the cartridge case, the item 2 was not produced using the same reloading die as the items 1.1, 1.2, 1.3 (known). 2: Due to the correspondence between their microscopic marks on base of the bullet and upper part of the cartridge case, the item 3 was produced using the same reloading die as the items 1.1, 1.2, 1.3 (known).   |
| BK4AG9  | 1: Exhibit 1 is three 9mm Luger known cartridges which were microscopically compared to the Exhibit 2 and 3 cartridges. 2: Exhibit 2 is one 9mm Luger cartridge. a. Microscopic comparison revealed toolmarks observed on Exhibit 2 could not be identified or eliminated as having been made by the same tool(s) as toolmarks observed on Exhibits 1 and 3 based on insufficient agreement or disagreement of discernable class and individual characteristics. 3: Exhibit 3 is one 9mm Luger   |

## TABLE 2

| WebCode | Conclusions   |
|---------|---|
|         | cartridge. a. Microscopic comparison revealed toolmarks observed on Exhibit 3 were made by the same tool(s) as toolmarks observed on Exhibit 1 based on sufficient agreement of discernable class and individual characteristics. TECHNICAL NOTES: Class characteristics are defined as measurable features of a firearm or tool, which indicate a restricted group source. They result from design features and are determined prior to manufacture of the firearm or tool. Individual characteristics are defined as marks produced by the random imperfections or irregularities of firearm or tool surfaces. These random imperfections or irregularities can be either produced incidental to manufacture or caused by use, corrosion, or damage, and are unique to that specific tool. Any conclusions indicating that a toolmark was made by a specific firearm or tool are not to the absolute exclusion of all other firearms or tools, because it is not feasible to examine all firearms or tools in the world. However, observing this amount of agreement between different sources is considered extremely remote.  |
| BLEERC  | Items - Description/Visual Examination: Item 1: Three (3) unfired 9mm caliber cartridges, no primer and gunpowder present, with reloading toolmarks present. Items 2 & 3: Two (2) unfired 9mm caliber cartridges, no primer and gunpowder present, with reloading toolmarks present. Microscopic Comparison Conclusions: Identification: Based upon the reproducibility of class characteristics and microscopic individual characteristics, the following identifications were made: Lab Item #3: Evidence Type: (1) unfired cartridge with reloading toolmarks. Conclusion: Reloading toolmarks were created by the same tool that created the reloading toolmarks on Item 1. Inconclusive: The following have an agreement of class characteristics; however due to a lack of agreement of microscopic individual characteristics, an identification or elimination was not made: Lab Item #2. Evidence Type: (1) unfired cartridge with reloading toolmarks. Conclusion: Reloading toolmarks are inconclusive as having been created by the same tool that created the reloading toolmarks on Item 1.   |
| BQNTEG  | Item T1-2 had an absence of marks. Therefore, there was no agreement or disagreement of individual characteristics to items T1-1 and T1-3. If there had been individual characteristics to observe, and identification or elimination may have been concluded.  |
| BRFN2P  | Reloading toolmarks present on the Item 1 and Item 3 cartridges were identified as having been produced by the same tool. A pattern examination of reloading toolmarks present on the Item 2 cartridge were inconclusive with reloading marks found on the Item 1 and Item 3 cartridges.  |
| BRGLAZ  | Item 3 was identified as having been reloaded by the same dies as Item 1. Item 2 was compared to reloading marks on Item 1, and although all class characteristics were similar, there was insufficient agreement of individual marks to make an identification. Therefore, the result is inconclusive.   |
| CGDQTF  | There was sufficient tools marks present on the mouth of casings 1 and 3 to indicate that they were loaded in the same loading press. The detail present on casing 2 indicated it had been loaded in another loading press.   |
| CJ6P39  | 1: Exhibit 1 contains three 9mm Luger caliber cartridges consistent with Starline Brand cartridge cases. 2: Exhibit 2 contains one 9mm Luger +P caliber cartridge consistent with a Starline Brand cartridge case. 3: Exhibit 3 contains one 9mm Luger caliber cartridge consistent with a Starline Brand cartridge case. 4: Examination of Exhibits 1, 2, and 3 revealed each cartridge case does not have a primer and does not appear to contain any propellant. Toolmarks observed on the cartridge components are consistent with toolmarks from tools used for ammunition reloading. 5: Exhibits 1, 2, and 3 were microscopically compared: a. Toolmarks observed on Exhibits 1 and 3 were made by the same tool due to agreement of class and individual characteristics. b. Toolmarks observed on Exhibit 2 could not be determined to be made by the same tool as the toolmarks observed on Exhibits 1 and 3 based on agreement of class characteristics either the insufficient agreement, insufficient disagreement, or absence of individual characteristics. For additional comparisons please submit the tool and/or additional cartridge case known samples of the same type as Exhibit 2. |
| CQ4EJC  | Items 2 and 3 were microscopically compared to each other and to the Item 1 cartridges, and Item 3 was identified as having been produced by the same reloading tool as Item 1. Item 2 was neither identified nor eliminated as having been produced by the same reloading tool as Item 1 or Item 3 due to agreement of class and disagreement of individual characteristics, but insufficient for an elimination.  |

TABLE 2

| WebCode | Conclusions  |
|---------|--|
| CWQ2G3  | Tool Mark Analysis: Methodology: Physical (Visual Examination), Microscopy (Comparison Microscope). The tool marks on Item 3, the unfired cartridge, was made with the same tool as tool marks on Item 1, the unfired cartridges, based upon corresponding class and individual microscopic characteristics. Comparisons between the tool marks on Item 2, the unfired cartridge, and tool marks on Item 1, the unfired cartridges, were inconclusive due to insufficient corresponding individual microscopic characteristics. Comparisons between the tool marks on Item 2, the unfired cartridge, and the tool marks on Item 3, the unfired cartridge, were inconclusive due to insufficient corresponding individual microscopic characteristics.  |
| D468TZ  | Item 3 was microscopically identified as having been reloaded by the same tool that reloaded Item 1. Item 2 and Items 1A, 1B, and 1C display similar types of reloading tool marks, however, differences in individual characteristics suggest different reloading equipment may have been used; the results are inconclusive.   |
| D64BJP  | 1: The scratch (tool marks) which found on neck of bullet in Item 3 (Second reloaded cartridge) which recovered from the scene was identical with Item 1: Three reloaded cartridges recovered from the suspect's residence (known). 2: Item 2: First reloaded cartridge (recovered from the scene) not related to the suspect's reloaded machine.  |
| D86BL9  | On comparison I found: 1). The characteristic marks on second reloaded cartridge recovered from the scene (questioned) Item 3 to be similar with three reloaded cartridges recovered from the suspect's residence (known) Item 1. Hence, I am of the opinion that questioned reloaded cartridge Item 3 was produced using the same reloading tool as the known reloaded cartridges Item 1. 2). The characteristic marks on first reloaded cartridge recovered from the scene (questioned) Item 2 to be insufficient for comparison with three reloaded cartridges recovered from the suspect's residence (known) Item 1. Hence, I am unable to determine whether the questioned reloaded cartridge Item 2 was produced using the same reloading tool as the known reloaded cartridges Item 1.  |
| DMY36N  | Items 1 through 3 consist of five (5) reloaded 9mm Luger cartridges that were missing the primer and bearing the headstamp of Starline ammunition. Toolmarks present on the Item 3 cartridge were identified as having been produced by the same reloading die as the Item 1 cartridges. A pattern examination of toolmarks present on the Item 2 cartridge to the Item 1 and Item 3 cartridges was inconclusive due to a lack of sufficient corresponding microscopic marks of value.   |
| DWNR3C  | The Item 2 cartridge is eliminated as having been reloaded using the same die(s) as was used to reload the Item 1 cartridges. The Item 3 cartridge is identified as having been reloaded using the same die(s) as was used to reload the Item 1 cartridges.  |
| E77RT6  | 1: Examination of Exhibits 1 through 3 revealed five (5) reloaded cartridges 9mm Luger caliber consistent with being manufactured by Starline USA. The cartridge does not have a primer and no propellant were observed. Suitable Toolmarks were observed on the bullet and cartridge case consistent with being made by reloading tools. 2: Microscopic comparison examination of the toolmarks observed on Exhibits 1 through 3 revealed: a. Toolmarks on Exhibit 1 and Exhibit 3 were made by the same tool due to an agreement of class and individual characteristics. b. Due to an agreement of class characteristics and insufficient agreement/disagreement of individual characteristics, the toolmarks observed on Exhibit 2 could not be identified or eliminated as having being made by the same tool as Exhibit 1 and 3. If any reloading tools or additional cartridge cases are found associated with the case, please submit them along with the Exhibits for further microscopic comparison. |
| EP6MQ3  | 1 vs 3 Microscopic comparisons were conducted between the reloaded 9mm + P cartridges (Item 1) and the reloaded 9mm + P cartridge (Item 3). There exists agreement of all discernable class characteristics and sufficient agreement of individual markings to identify (Item 1) and (Item 3) as having been reloaded using the same reloading equipment. 1 vs 2 Microscopic comparisons were conducted between the reloaded 9mm + P cartridges (Item 1) and the reloaded 9mm Luger cartridge (Item 2). The results of the examination and comparison were inconclusive. The inconclusive result was based on the lack of sufficient agreement of individual markings to identify or eliminate the cartridge as having been reloaded using the same equipment as the cartridges (Items 1).   |

TABLE 2

| WebCode | Conclusions  |
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| F7N2JL  | Item 1 through Item 3 are 9mm Luger (9x19mm) cartridges bearing the headstamp of Starline ammunition. The cartridges do not possess a primer or powder and are not consistent with functional ammunition. Toolmarks present on the Item 1 and Item 3 cartridges were identified as having been produced by the same tool. A pattern examination of toolmarks present on Item 1 and Item 3 cartridges to the Item 2 cartridge was inconclusive due to a lack of sufficient corresponding microscopic marks of value.  |
| FAJRQW  | Comparison microscope examinations were conducted, and the findings of this examiner are as follows: The toolmarks found on the submitted reloaded cartridge, Item 3, were identified as having been made by the same reloading tool that produced the known toolmarks on Item 1. The toolmarks found on the reloaded cartridge, Item 2, were not made by the same reloading tool that produced the known toolmarks on Item 1, based on differences in individual characteristics  |
| FCQ82A  | Item #1-3 was microscopically compared to item #1-1 and found to have areas of corresponding individual characteristics. They were identified as having been reloaded using the same tool. Item #1-2 was microscopically compared to item #1-1 and found to have similar characteristics; however, the comparison was inconclusive due to insufficient agreement or disagreement of individual characteristics and small sample size.  |
| FRQRYZ  | Toolmark Analysis: Methodology: Comparison Microscopy. The tool mark on Items 1 and 3, the cartridges, were made by the same tool based upon corresponding class and individual microscopic characteristics. Comparisons between the tool mark on Item 2, the cartridge, and the tool mark on Items 1 and 3, the cartridges, were inconclusive due to insufficient individual microscopic characteristics.   |
| FTWAYG  | Second reloaded cartridge recovered from the scene (Item 3) was produced using the same reloading die as the reloaded cartridges recovered from suspect's residence (Item 1). First reloaded cartridge recovered from the scene (Item 2) was produced using a diferent reloading die.  |
| FY37JG  | [No Conclusions Reported.]   |
| G2P7X4  | 1: Examination of Exhibit 1 revealed three 9mm Luger +P cartridges. 2: Examination of Exhibit 2 revealed one 9mm Luger cartridge. 3: Examination of Exhibit 3 revealed one 9mm Luger +P cartridge. 4: Examination of the cartridges of Exhibits 1, 2, and 3 revealed: a. Each cartridge has the primer and powder removed. b. Each cartridge case is marketed by Starline. c. Each cartridge displays toolmarks consistent with the type of marks produced in the loading/reloading process and are suitable for microscopic comparison. 5: Microscopic comparison of Exhibits 1, 2, and 3 revealed: a. Exhibits 1 and 3 were reloaded using the same reloading equipment due to agreement of class characteristics and sufficient agreement of individual characteristics. b. Exhibit 2 was not reloaded using the same reloading equipment as Exhibits 1 and 3 due to agreement of class characteristics and sufficient disagreement of individual characteristics. Observing this amount of disagreement from the same source is considered extremely remote. Class characteristics are defined as measurable features of a firearm/tool which indicate a restricted group source. They result from design features and are determined prior to manufacture of the firearm/tool. Individual characteristics are defined as marks produced by the random imperfections or irregularities of firearm/tool surfaces. These random imperfections or irregularities are produced incidental to manufacture and/or caused by use, corrosion, or damage, and are unique to that specific tool. Any conclusions indicating that a toolmark was made by a specific firearm/tool are not to the absolute exclusion of all other firearms/tools because it is not feasible to examine all possible firearms/tools. However, observing this amount of agreement from a different source is considered extremely remote. |
| GA3VZH  | Reloading tool marks on item #2 and item #3 were microscopically examined and compared to the reloading tool marks on item #1. The reloading tool marks on item #3 are identified as being made by the same reloading die as the reloaded cartridges recovered from the suspects residence, item #1, based on significant agreement seen in the striations created by the die. The reloaded cartridge, item #2, was eliminated as being reloaded by the same reloading die as items #1 and items #3 based on the observance of significant difference in individual characteristics.   |

## TABLE 2

| WebCode | Conclusions   |
|---------|---|
| GBDZAZ  | Toolmarks observed on the Item 1 unfired cartridges were microscopically intercompared, revealing correspondence of class characteristics and individual distinguishing characteristics. The Item 1 unfired cartridges exhibit reproducing toolmarks from the same reloading die. The toolmarks on the Item 1 unfired cartridges were microscopically compared to toolmarks observed on the Item 2 unfired cartridge, revealing class characteristic and significant individual characteristic differences. It was concluded that the toolmarks observed on the Item 1 cartridges were made by a different reloading die than was used to reload the Item 2 cartridge. The toolmarks on the Item 1 unfired cartridges were microscopically compared to toolmarks observed on the Item 3 unfired cartridge, revealing correspondence of class characteristics and individual distinguishing characteristics. It was concluded that the toolmarks observed on the Item 1 and Item 3 cartridges were produced by the same reloading die.   |
| GDKDV9  | The item 1A, 1B and 1C and the item 3 cartridge are identified as having been reloaded by the same loading press/die. The item 2 cartridge is eliminated as having been reloaded by the same loading press/die that loaded the item 1A, 1B, 1C and the item 3 cartridge.  |
| GPWKVE  | after comparing item number (1) with item number (3), we found a similarities in microscopic marks in both items: no seemlier microscopic marks were found between item (1) and item (2).   |
| GR2DL8  | Examinations showed Item 2 was not produced by the same reloading die as Item 1. Examinations showed Item 3 was produced by the same reloading die as Item 1.   |
| GRKWW7  | Item 2: The questioned toolmarks on Item 2 could have been eliminated as having been made by the same tool as Items 1 and 3; however, absence of markings and insufficiency of dissimilar characteristics precludes further elimination. Item 3: The questioned toolmarks on Item 3 were made by the same tool as Item 1, as a result of the sufficient agreement between their individual characteristics.   |
| GRZDPD  | Through macroscopic/microscopic examination and based on agreement of discernible class characteristics and sufficient corresponding individual detail, the toolmarks exhibited on the perimeter of the mouth of the unprimed cartridges, Laboratory Items 1 and 3, were identified as having been created by contact with the same tool. Based on macroscopic/microscopic examination the toolmarks exhibited on the perimeter of the mouth of the unprimed cartridge, Laboratory Item 2, exhibit similar class characteristics as the toolmarks exhibited on the perimeter of the mouth of the unprimed cartridges, Laboratory Items 1 and 3. However, due to the lack of corresponding individual detail the toolmarks exhibited on the perimeter of the mouth of the unprimed cartridge, Laboratory Item 2 could neither be identified nor eliminated as having been created by contact with the same tool that created the toolmarks exhibited on the perimeter of the mouth of the unprimed cartridges, Laboratory Items 1 and 3. The results of these examinations are inconclusive.   |
| GTU7KW  | The same reloading die was identified within the limits of practical certainty <sup>1</sup> , as having been used on the Item 1 and Item 3 reloaded cartridges. The reloading die used on Item 1 could neither be identified nor eliminated as the reloading die used on Item 2.  |
| GXPV24  | 1: Examination of Exhibit 1 revealed three 9mm Luger +P cartridges with cartridge cases manufactured by Starline. The Exhibit 1 cartridges contained no primer and displayed toolmarks consistent with those caused by the reloading process. 2: Examination of Exhibit 2 revealed one 9mm Luger cartridge with a cartridge case manufactured by Starline. Exhibit 2 contained no primer and displayed toolmarks consistent with those caused by the reloading process. 3: Examination of Exhibit 3 revealed one 9mm Luger +P cartridge with a cartridge case manufactured by Starline. Exhibit 3 contained no primer and displayed toolmarks consistent with those caused by the reloading process. 4: Microscopic comparison revealed Exhibit 1 and Exhibit 3 were reloaded using the same equipment due to an agreement of class characteristics and sufficient agreement of individual characteristics. 5: Microscopic comparison revealed it could not be determined if Exhibit 1 and Exhibit 2 were reloaded using the same equipment due to an agreement of class characteristics and insufficient agreement of individual characteristics. TECHNICAL NOTES: Class characteristics are defined as measurable features of a tool which indicate a restricted group source. They result from design features and are determined prior to manufacture of the tool. Individual characteristics are defined as marks produced |

TABLE 2

| WebCode | Conclusions  |
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|         | by the random imperfections or irregularities of tool surfaces. These random imperfections or irregularities are produced incidental to manufacture and/or caused by use, corrosion, or damage, and are unique to that specific tool. Any conclusions indicating that a toolmark was made by a specific tool are not to the absolute exclusion of all other tools because it is not feasible to examine all possible tools. However, observing this amount of agreement from a different source is considered extremely remote.  |
| HETRZT  | The toolmarks on the known sourced cartridge cases and bullets from Item 1 were microscopically examined and then compared with the toolmarks on Item 2 and Item 3. Item 2 Microscopic comparison of the toolmarks on Item 1 and Item 2 revealed that they have similar class of toolmarks, but significant disagreement in individual toolmarks. The toolmarks on Item 2 were not produced by the same reloading die as the known sourced reloaded cartridges, Item 1. Item 3 Sufficient agreement in class and individual characteristics was observed between the known sourced toolmarks on Item 1 and the toolmarks on Item 3 to conclude that Item 3 was produced using the same reloading die as the known sourced reloaded cartridges.   |
| HHNJ76  | Items - Description/Visual Examination: Item 1: Three (3) unfired 9mm caliber cartridge case dummies, no primer or gunpowder, with reloading toolmarks present. Items 2-3: Two (2) unfired 9mm caliber cartridge case dummies, no primer or gunpowder, with reloading toolmarks present. Microscopic Comparison Conclusions Identification: Based upon the reproducibility of class characteristics and microscopic individual characteristics, the following identifications were made: Lab Item #3 Evidence Type: (1) unfired cartridge with reloading toolmarks. Conclusion: Reloading toolmarks were created by the same tool that created the reloading toolmarks on Item 1. Inconclusive: The following have an agreement of class characteristics; however due to a lack of agreement of microscopic individual characteristics, an identification or elimination was not made: Lab Item #2. Evidence Type: (1) unfired cartridge with reloading toolmarks. Conclusion: Reloading toolmarks are inconclusive as having been created by the same tool that created the reloading toolmarks on Item 1.  |
| HPPV4M  | The cartridge, item 3, was identified as having been reloaded by the same reloading die as item 1, based on agreement of individual characteristics. The cartridge, item 2, was consistent in all observable class characteristics (caliber) as item 1. However, due to an absence of individual microscopic markings, the cartridge could neither be eliminated nor identified as having been reloaded in the same reloading die as item 1. The results are inconclusive.   |
| HVDDL6  | Visual and microscopic analyses of the reloaded cartridges were initiated on April 15, 2021 and the results of the comparisons and evaluations are as follows: Based on discernible class characteristics and sufficient agreement of individual characteristics, the reloaded cartridge QL2 (Item 3) and the reloaded cartridges KL1 through KL3 (Item 1) were produced using the same reloading die. Based on significant disagreement of individual characteristics the reloaded cartridge QL1 (Item 2) was not produced with the same reloading die as QL2 (Item 3) or KL1 through KL3 (Item 1).   |
| J6X78Z  | 1): Exhibits 1 (Three 9mm Luger Cartridges), 2 (One 9mm Luger Cartridge), and 3 (One 9mm Luger Cartridge) were visually examined and microscopically compared to determine if the reloading toolmarks observed on all of the cartridges were caused by the same tool. a). The reloading toolmarks on the Exhibit 1 cartridges and the Exhibit 3 cartridge were caused by the same tool based on an agreement of all discernible class characteristics and a sufficient agreement of individual characteristics. b). It could not be determined if the reloading toolmarks on the Exhibit 1 cartridges and the Exhibit 2 cartridge were or were not made by the same tool based on an agreement of discernible class characteristics and an insufficient agreement or disagreement of individual characteristics. TECHNICAL NOTES: Class characteristics are defined as measurable features of a firearm or tool, which indicate a restricted group source. They result from design features and are determined prior to manufacture of the firearm or tool. Individual characteristics are defined as marks produced by the random imperfections or irregularities of firearm or tool surfaces. These random imperfections or irregularities can be either produced incidental to manufacture or caused by use, corrosion, or damage, and are unique to that specific tool. Any conclusions indicating that a toolmark was made by a specific firearm or tool are not to the absolute exclusion of all other firearms or tools, because it is not feasible to examine all firearms or tools in the world. However, observing this amount |



## TABLE 2

| WebCode | Conclusions   |
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|         | of agreement between different sources is considered extremely remote.  |
| JNCKPV  | I conducted a comparative microscopic examination between the three cartridges (Item 1) and the two cartridges (Item 2 and Item 3). This revealed the following: The single cartridge (Item 2), was not reloaded using the same equipment as was used to reload Items 1 and 3. All four cartridges in Items 1 and 3 were reloaded using the same equipment. In my opinion, this equipment had left sufficiently clear striated marks, both in quality and quantity on the case wall near the mouth and on the bullet jacket close to where it was seated in the case mouth, to allow this conclusion to be formed.  |
| JUFPET  | I compared the three cartridges Item 1 with each other and found correspondence of individual stria on the case mouth and bullet from the bullet crimping operation on all three. Conclusion, all three cartridges Item 1 were crimped with the same die. I compared Item 3 with the three cartridges Item 1. I found sufficient correspondence of individual stria at the case mouth and on the bullet between item 3 and item 1 for identification. Conclusion: Item 3 and Item 1 were crimped with the same die. I compared the cartridge item 2 with Items 1 and 3. Item 2 has similar crimp marks to those on Items 1 and 3 however I found no correspondence of individual marks on the case mouth or bullet and insufficient differences in individual marks for exclusion. Conclusion: cannot identify or eliminate.  |
| JVC348  | [No Conclusions Reported.]  |
| K6FFZ2  | Results: Item 1-1-1 (CTS Item 1) cartridges were submitted as known reloaded cartridges. Apparent reloading toolmarks (striated) were observed on all three of the submitted known reloaded cartridges. The toolmarks were determined to be suitable for microscopic comparison. Item 1-2-1 (CTS Item 2) cartridge was submitted as a questioned reloaded cartridge. Apparent reloading toolmarks (striated) were observed on item 1-2-1 cartridge. The toolmarks were determined to be suitable for microscopic comparison. Item 1-3-1 (CTS Item 3) cartridge was submitted as a questioned reloaded cartridge. Apparent reloading toolmarks (striated) were observed on item 1-3-1 cartridge. The toolmarks were determined to be suitable for microscopic comparison. Conclusions: Based on agreement of all discernible class characteristics, the toolmarks on items 1-2-1 and 1-3-1 cartridges were microscopically compared to the toolmarks on one of the known cartridges from item 1-1-1. The comparison of the toolmarks on item 1-2-1 cartridge to the toolmarks on a known cartridge from item 1-1-1 was inconclusive, in the opinion of the laboratory. Some limited agreement in the patterns of microscopic markings was observed between the compared items, however, that agreement was insufficient for a conclusion of identification. The toolmarks on item 1-3-1 cartridge were identified as having been made by the same tool as the toolmarks on one of the known cartridges from item 1-1-1, in the opinion of the laboratory. The identification conclusion was based on similarities in the patterns of microscopic markings observed between the compared items. |
| KE64V4  | Marks consistent with reloading were observed on the case walls of all the submitted cartridge cases. The marks on Exhibit #1 were compared microscopically with the marks on Exhibits #2 and #3. They all have agreement in class characteristics. Exhibit #2: There is sufficient disagreement in individual characteristics for elimination. The source of the marks on Exhibits #1 and #3 is not the source of the marks on Exhibit #2. Exhibit #3: There is sufficient agreement in corresponding individual characteristics for identification. The source of the marks on Exhibit #3 is the same as Exhibit #1.  |
| KHGDJR  | Comparison microscope examinations were conducted and the findings of this examiner are as follows: 1. The toolmarks found on the submitted reloaded cartridge, Item 3, were identified as having been made by the same reloading tool that produced the known toolmarks on Item 1. 2. The toolmarks found on the submitted reloaded cartridge, Item 2, were not made by the same reloading tool that produced the toolmarks on Item 1.   |
| KJFGBG  | The recovered questioned cartridges (Item 2 and Item 3) have fired in the same reloaded as the known cartridges (Item 1).   |
| KKA349  | The evidence in items 1, 2, and 3 was analyzed by physical and microscopic examination. The toolmarks present on the reloaded cartridge in item 3 were determined to have been made by the same reloading die as the three reloaded cartridges in item 1. The toolmarks present on the reloaded cartridge in item 2 were determined not to have been made by the same reloading die as the three  |

## TABLE 2

| WebCode | Conclusions  |
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|         | reloaded cartridges in item 1. Further analysis is pending submission of another reloading die for additional comparison.  |
| L69P99  | Based on macroscopic/microscopic examination the toolmarks present on the perimeter of the mouth of the unprimed cartridge, Laboratory Item 2, exhibit similar class characteristics as the toolmarks present on the perimeter of the mouth of the unprimed cartridges, Laboratory Items 1 and 3. However, due to the lack of sufficient corresponding individual detail, the toolmarks exhibited on Laboratory Item 2 could neither be identified nor eliminated as having been created by contact with the same tool that created the toolmarks exhibited on Laboratory Items 1 and 3. The results of these examinations are inconclusive. Through macroscopic/microscopic examination and based on agreement of discernible class characteristics and sufficient corresponding individual detail, the toolmarks present on the perimeter of the mouth of the unprimed cartridges, Laboratory Items 1 and 3, were identified as having been created by contact with the same tool. |
| L99ZZ3  | Reloading marks from cartridges marked #1 known to have been reloaded with the reloading die were examined and microscopically compared to the reloading marks seen on the cartridge marked #2 with inconclusive results. Reloading marks from cartridges marked #1 known to have been reloaded with the reloading die were examined and microscopically compared to the reloading marks seen on the cartridge marked #3 with positive (identification) results. The cartridges marked #1 and #3 were both reloaded using the same reloading die.  |
| LBDNGD  | Item 2 and Item 3 were reloaded using the same reloading tool as reloaded cartridges in Item 1.  |
| LG42GF  | Examinations showed the bullet and cartridge case of Item 3 to have sufficient corresponding striated marks that were in contact with the same sources as the cartridges in Item 1. Examinations showed the bullet of Item 2 to have insufficient corresponding marks for identification; however, sufficient corresponding striated marks in the extractor groove of Item 2 indicate the cartridge case was in contact with the same source as the the cartridges in Items 1 and 3.   |
| LK48X8  | The 9mm Luger cartridge (item 3) was identified as having been assembled by the same reloading die as the three 9mm Luger cartridges (item 1). Agreement of the characteristics is sufficient to determine that the four 9mm Luger cartridges were assembled by the same reloading die. The 9mm Luger cartridge (item 2) could not be conclusively identified or excluded as having been assembled by the same reloading die as the three 9mm Luger cartridges (item1). There was agreement of all discernible class characteristics, but no significant agreement or disagreement of the individual characteristics was noted. The 9mm Luger cartridge (item 2) could have been assembled by the same reloading die as the three 9mm Luger cartridges (item 1) or any other reloading die with similar characteristics.   |
| M4BYFY  | The visual and microscopic analyses of the reloaded cartridges QL1, and QL2 (Items 2 and 3) and suspect cartridges (Item 1) were initiated on 6/10/2021 and the results of the comparisons and evaluations are as follow: Based on agreement of class characteristics and sufficient agreement of individual characteristics, the toolmarks created during the reloading of QL2 (Item 3) were created by the same reloading die(s) as the suspect cartridges, Item 1. Based on significant disagreement of individual characteristics, the toolmarks created during the reloading of QL1 (Item 2), were created with a different reloading die(s) than that of the suspect cartridges, Item 1.   |
| MKJT89  | after comparing item number (1) with item number (3), we found a similarities in microscopic marks in both items: no seemlier microscopic marks were found between item (1) and item (2).  |
| MNHAFW  | Item 2 could not be identified or eliminated as having been marked by the same reloading die tool that marked Item 1 due to the lack of individual characteristics on bullet and insufficient agreement of individual characteristics on cartridge cases. Item 3 was identified as having been marked by the same reloading die tool that marked Item 1 based on sufficient agreement of individual characteristics observed.  |
| MX7Z3N  | The 01-AB cartridge (Item 2) was microscopically compared to the 01-AA cartridges (Item 1) with INCONCLUSIVE RESULTS. Due to the insufficient agreement or disagreement of individual characteristics, the 01-AB cartridge (Item 2) could neither be identified nor eliminated as having been made by the same reloading tool as the 01-AA cartridges (Item 1). The 01-AC cartridge (Item 3) was   |

## TABLE 2

| WebCode | Conclusions   |
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|         | microscopically compared to the 01-AA cartridges (Item 1) with POSITIVE RESULTS. The 01-AC cartridge (Item 3) was made by the same reloading tool as the 01-AA cartridges (Item 1).   |
| MXTB2X  | Exhibit 2 could have been reloaded by the same tools used to reload the cartridges submitted as Exhibit 1 based on agreement of class characteristics; however, due to a lack of reproducible detail a more conclusive determination could not be rendered. Exhibit 3 was identified as having been reloaded using the same tools which were used to reload the cartridges submitted as Exhibit 1 based on agreement of class and individual characteristics.   |
| NRUC3R  | Items 1, 2, and 3 exhibit agreement of all discernible class characteristics but cannot be identified or eliminated as having been marked by the same tool, as a suspect tool was not submitted. The source of the toolmarks cannot be determined and the suspect tool should be submitted for further examination.   |
| PUELPY  | Evidence Received: Item 1: Three (3) Starline caliber 9mm Luger cartridges. Item 2: One (1) Starline caliber 9mm Luger cartridge. Item 3: One (1) Starline caliber 9mm Luger cartridge. Results: Items 1, 2 and 3 were microscopically examined. Toolmarks present on the Item 1 and 3 cartridges were identified as having been produced by the same tool based on corresponding class and individual characteristics. Toolmarks present on Item 2 exhibit similar class characteristics as those present on Items 1 and 3; however, the result of the comparison was inconclusive due to the lack of sufficient corresponding microscopic markings. It was not possible to identify or eliminate the toolmarks on Item 2 as having been produced by the same tool that produced the toolmarks on Items 1 and 3.   |
| PWA7HP  | There was sufficient agreement between item 1.1, 1.2 and 1.3 and item 3 of a combination of individual characteristics and all discernible class characteristics where the extent of agreement exceeds that which can occur in the comparison of toolmarks made by different tools and is consistent with the agreement demonstrated by toolmarks known to have been produced by the same tool. There was significant disagreement of discernible individual characteristics between item 1.1/1.2/1.3 and item 2. And can therefore be excluded from having come from the same source.  |
| QNPMBV  | One of the cartridges (1-02) was not identified or eliminated as having been marked by the same tool as one of the cartridges (1-03) or the three cartridges submitted as knowns (1-01) due to agreement in available class characteristics but a lack of consistent and repeatable individual marks. One of the cartridges (1-03) was identified as having been marked by the same tool that marked the three cartridges submitted as knowns (1-01) due to consistent and repeatable marks.  |
| QTHPGF  | The cartridge marked 2 displayed significant disagreement in individual characteristics compared to the cartridges marked 1/A, 1/B and 1/C. The cartridge marked 2 was eliminated as having been reloaded using the same bullet seating die as the cartridges marked 1/A, 1/B and 1/C. The cartridge marked 3 displayed significant agreement in individual characteristics compared to the cartridges marked 1/A, 1/B and 1/C. The cartridge marked 3 was identified as having been reloaded using the same bullet seating die as the cartridges marked 1/A, 1/B and 1/C.  |
| QWG3ZY  | Item 2 was not produced using the same reloading die as Item 1. Item 3 was produced using the same reloading die as Item 1.   |
| QYAWZP  | Reloaded cartridges from Item 1 were compared to each other. Following these comparisons, circular lines around the tip of the bullet and around the lip of the case were observed in agreement between the three cartridges from item 1. The features are due to the reloading die surface pushing the bullet down into the case and the tightening the case around the bullet. These features were compared between Item 1 and Item 2. No agreement has been observed. If we assume that these cartridges were prepared in a short time period and that the tool surface did not change significantly during that period, it is our opinion that we can exclude the reloading die used to manufacture Item 1 also produce Item 2. Indeed, the differences observed are significant and, given the above-assumption, cannot be explained other than by a difference of source. It is our conclusion that the cartridge item 2 has been prepared with a different set of reloading tools than the tools used for the cartridges item 1. The same features were compared between Item 1 and Item 3. They were found in agreement in terms of shapes, striations and relative positions. We have made no observation that would indicate that |

## TABLE 2

| WebCode | Conclusions   |
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|         | different tools were used to prepare these cartridges. However, we are lacking information and data about the reloading die and the variability of toolmarks different reloading dies could leave. We are thus not in a position to assess the strength of the agreement that we have observed. The observations do provide support for the view that the same tools has been used (as opposed to different tools), but without any further investigation and data gathering, we cannot say how much support our observations provide towards that view. It is in that sense that we concluded to conclusive.   |
| QZ2TQ4  | [No Conclusions Reported.]  |
| RV7HUB  | Item 1 through Item 3 consists of five 9mm Luger (9x19mm) cartridges that are loaded with jacketed round nose bullets and bear the headstamp of Starline ammunition. Toolmarks present on the Item 1 and Item 3 cartridges were identified as having been produced by the same tool. A pattern examination of toolmarks present on the Item 1 and Item 2 cartridges and the Item 2 and Item 3 cartridges was inconclusive due to a lack of sufficient corresponding microscopic marks of value.   |
| T6ATZZ  | The evidence in items 1, 2, and 3 was analyzed by physical and microscopic examination. The toolmarks present on the reloaded cartridge in item 3 were determined to have been made by the same reloading die as the three (3) reloaded cartridges in item 1. The reloaded cartridge in item 2 was determined not to have been reloaded by the same reloading die as the three (3) reloaded cartridges in item 1. Further analysis is pending submission of another reloading die for additional comparison.  |
| T6LRTN  | The reloaded cartridges marked #1 were examined and microscopically compared to the reloading marks on the cartridge marked #2 with inconclusive results. There was an insufficient amount of reloading marks on #2 for comparisons. The reloaded cartridges marked #1 were examined and microscopically compared to the reloading marks on the cartridge marked #3 with positive results (identification). The reloading marks on the cartridge marked #3 were made by the same reloading machine as the cartridges marked #1.   |
| TK4HVV  | Microscopic examination of the cartridge from Item 2 shows micro-striae on the collar of the casing. Microscopic examination of the cartridge from Item 3 shows longitudinal micro-striae around the collar of the casing and around the base of the bullet. These marks were produced using reloading tools. The comparative examination of the tool marks shows sufficient differences within their general characteristics to state that the cartridge were not produced using the same tool. The cartridges from Item 1 also show longitudinal micro-striae around their collars and around their bullets. These marks show the same general characteristics as those examined on Item 3. The comparative examination of the individual characteristics reveals sufficient agreement to state that the cartridges from Item 1 and the cartridge from Item 3 were reloaded with the same seating tool. |
| TYGTJJ  | Comparison microscope examinations were conducted and the findings of this examiner are as follows: 1. The tool marks found on the submitted reloaded cartridge, Item 3, were identified as having been made by the same reloading tool that produced the known tool marks on Item 1. 2. The tool marks found on the submitted reloaded cartridge, Item 2, were not made by the same reloading tool that produced the known tool marks on Item 1, based on differences in individual characteristics.   |
| U9PKP8  | Toolmarks present on the Item 1 and Item 3 reloaded cartridges were identified as having been produced by the same tool. A pattern examination of toolmarks present on the Item 2 reloaded cartridge was inconclusive to those on the Item 1 and Item 3 reloaded cartridges due to a lack of sufficient corresponding microscopic marks of value.   |
| UKWXGT  | Items A1-1, A1-2, and A1-3: The Items A1-1, A1-2 and A1-3 unprimed cartridges are consistent in class characteristics. Item A1-1 was compared to item A1-2. The Item A1-1 toolmarks exhibit the same discernable class characteristics as those present on Item A1-2; however, because of the lack of sufficient suitable corresponding microscopic markings, it is not possible to identify or eliminate the toolmarks on items A1-1 and A1-2 as having been produced by the same tool. Item A1-1 was compared to item A1-3. The Item A1-3 toolmarks were examined, compared microscopically, and identified as having been produced by the same tool as the toolmarks on the Item A1-1 unprimed cartridges.   |

TABLE 2

| WebCode | Conclusions   |
|---------|---|
| V6GWMM  | Items 2 and 3 were examined and microscopically compared to the known reloaded cartridges submitted as Item 1. Item 2 was not reloaded with the die used to reload the Item 1 cartridges. Item 3 was reloaded with the die used to reload the Item 1 cartridges.  |
| V6ZX86  | It is to be taken into the closest consideration that the cartridge "Item 3" was manufactured with the same reloading device as the cartridges "Item 1", which were found on the suspect. The evidence strongly suggests that the "Item 2" cartridge was manufactured on the same reloading equipment as the "Item 1" cartridges found on the suspect.  |
| VNAUMU  | Microscopic examination and comparison of the tool marks on the Starline cartridges (Items 1, 1A, 1B and 3) revealed sufficient agreement of individual characteristics to conclude that they were created by the same tools. Microscopic examination and comparison of the tool marks on the Starline cartridge (Item 2) failed to reveal sufficient quantity and quality of individual characteristics to determine whether or not they were created by same tools that were used to create the tool marks on the Starline cartridges (Items 1, 1A, 1B and 3). Evidence examined for this report will be returned to the [Laboratory] Quality Manager.  |
| W4ML6T  | The toolmarks on Item 1 through Item 3 were microscopically compared to each other based on agreement of class characteristics. The toolmarks on Item 1 and Item 3 were identified as having been produced by the same tool due to sufficient agreement of individual characteristics. The toolmarks on Item 2 were eliminated as being produced by the same tool as Item 1 and Item 3 due to significant differences of individual characteristics. The significance of this identification is made to the practical, not absolute, exclusion of all other toolmarks.  |
| W6DPXZ  | By means of microscopic exam and microscopic comparison of tools, it has been determined that the second reloaded cartridge recovered from the scene (Item 3) is produced using the same reloading die as the reloaded cartridges recovered from the suspect's residence (Item 1).  |
| WE3DT3  | on examining the exhibits (1,2,3), it was concluded that exhibit 1 and 3 have same individual characterises, therefore they are from the same reloading die. whereas exhibit 2 was found to be from different reloading die. so it was eliminated.  |
| WFELCQ  | Toolmarks present on Items 1, 2 and 3 were microscopically examined. Toolmarks on Items 1 and 3 were identified as having been produced by the same tool based on corresponding class and individual characteristics. Toolmarks on Item 2 exhibit similar general class characteristics as those noted on Items 1 and 3; however, the result of the comparison is inconclusive due to a lack of sufficient corresponding microscopic markings. The toolmarks present on Item 2 could not be identified or eliminated as having been produced by the same tool as the toolmarks noted on Items 1 and 3.  |
| WH4JAU  | [No Conclusions Reported.]  |
| X8ZNQP  | THE FOLLOWING EVIDENCE WAS RECEIVED, ANALYZED ON THE BELOW LISTED DATES, AND MARKED FOR IDENTIFICATION AS FOLLOWS: ITEM 1: THREE RELOADED CARTRIDGES, LABELED K1. ITEM 2: ONE RELOADED CARTRIDGE, LABELED QL1. ITEM 3: ONE RELOADED CARTRIDGE, LABELED QL2. RESULTS: VISUAL AND MICROSCOPIC ANALYSES OF THE ABOVE EVIDENCE WERE PERFORMED STARTING JUNE 2, 2021, AND THE RESULTS OF THE COMPARISONS AND EVALUATIONS ARE AS FOLLOWS: BASED ON AGREEMENT OF DISCERNIBLE CLASS CHARACTERISTICS AND SUFFICIENT AGREEMENT OF INDIVIDUAL CHARACTERISTICS, TOOLMARKS PRESENT ON THE QL2 CARTRIDGE AND THE K1 CARTRIDGES WERE IDENTIFIED AS HAVING BEEN PRODUCED BY THE SAME UNKNOWN TOOLS. TOOLMARKS IDENTIFIED WERE CONSISTENT WITH THOSE PRODUCED BY A CRIMPING DIE AND A BULLET SEATING DIE. TOOLMARKS PRESENT ON THE QL1 CARTRIDGE WERE FOUND TO EXHIBIT SIMILAR CLASS CHARACTERISTICS AS THOSE PRESENT ON THE K1 AND QL2 CARTRIDGES; HOWEVER, DUE TO THE LACK OF SUFFICIENT SUITABLE CORRESPONDING MICROSCOPIC MARKINGS, IT WAS NOT POSSIBLE TO IDENTIFY OR ELIMINATE TOOLMARKS PRESENT ON QL1 AS HAVING BEEN PRODUCED BY THE SAME TOOLS AS TOOLMARKS PRESENT ON K1 AND QL2. SHOULD ANY OTHER SUSPECT TOOLS OR EVIDENCE BE RECOVERED, PLEASE SUBMIT AND REFERENCE THE |

## TABLE 2

| WebCode | Conclusions   |
|---------|---|
|         | <p>ABOVE CC #. SUFFICIENT AGREEMENT: "Sufficient agreement" exists between two toolmarks means that the agreement is of a quantity and quality that the likelihood another tool could have made the mark is so remote as to be considered a practical impossibility. Sufficient agreement is related to the significant duplication of random toolmarks as evidenced by a pattern or combination of patterns of surface contours.</p>   |
| XBKU6   | <p>The case mouth of four of the five 9mm Luger "cartridges" (Items 1A - 1C and 3) were crimped by the same reloading die. The case mouth of the remaining 9mm Luger "cartridge" was most likely crimped by a second reloading die.</p>   |
| XG6V7P  | <p>Microscopic comparison examinations were conducted between (questioned tool marks) Q-1, Q-2 and (known tool marks) K-1A, K-1B, and K-1C, resulting in the conclusions: The tool mark on item 2 (Q-1) could not be identified or eliminated as having been made with the same unknown tool that made the tool marks on K-1A, K-1B, K-1C and Item 3 (Q-2). This conclusion was based on an agreement of all discernable class characteristics and a lack of sufficient agreement or disagreement of individual characteristics. The tool mark on item 3 (Q-2) was made with the same unknown tool that made the tool marks on K-1A, K-1B, and K-1C. This conclusion was based on a sufficient agreement of individual characteristics.</p>   |
| XJT84A  | <p>Striated marks were observed at the case mouths of the Item 1, Item 2, and Item 3 cases. It is suspected that these marks were made by a tool that crimps the mouth of each case against the bullet during the reloading process. This tool was not provided by investigators, thus preventing an examination of the part of the crimping tool that left the striated marks at the case mouths (the working surface of the crimping tool). An assessment of that working surface may allow an examiner to determine if the process used to manufacture the crimping tool's working surface is one that would leave striated marks which are individual in nature or have the potential for being subclass. Sufficient agreement of the striated marks at the case mouths of the Item 1 cases and the Item 3 case was observed to conclude that the marks share a common source. However, as discussed above, the possibility for these marks being subclass in nature has to be considered. As a result, I am of the opinion that the case mouth crimping marks seen in the Item 1 cases and the Item 3 case were made by the same reloading tool, or different reloading tools that were manufactured at similar times. This opinion may change if the suspected reloading tool becomes available for examination. Sufficient agreement of the case mouth striated marks was not seen between the Item 1 cases and the Item 2 case. As a result, I am of the opinion that the reloading tool responsible for leaving the case mouth crimp marks on Item 1 cases did not leave the case mouth crimp marks seen in the Item 2 case.</p> |
| XQBHEP  | <p>The Items 01-01, 01-02, 01-03, and 01-05 cartridge cases with seated bullets were all identified as having been marked by the same unknown tool(s). The Item 01-04 cartridge case with seated bullet was unable to be identified or eliminated as having been marked by the same unknown tool(s) as the Items 01-01, 01-02, 01-03, and 01-05 cartridge cases with seated bullets due to a lack of reproducible marks.</p>  |
| XQD6V3  | <p>1: The cartridges marked from E-1 to E-3, described in Item 1, and the cartridge marked E-5, described in Item 3, were reloaded by the same tool ("Reloading Die"), (identification). 2: The cartridge marked E-4, described in Item 2, was not reloaded by the tool ("Reloading Die") that reloaded the cartridges marked from E-1 to E-3, described in Item 1, and the cartridge marked E-5, described in Item 3, (elimination).</p>   |
| XXCWZQ  | <p>1): Examinations showed that Item 2 does not have tool marks present which were produced by the same source as the tool marks present on the Item 1 cartridges. 2): Examinations showed that Item 3 has tool marks present which were produced by the same source as the tool marks present on the Item 1 cartridges.</p>  |
| YAYLBF  | <p>The tool mark on Item 3, the unfired cartridge, was made with the same tool as Items 1A, 1B, and 1C, the unfired cartridges, based upon corresponding class and individual microscopic characteristics. Comparisons between the tool mark on Item 2, the unfired cartridge, and test marks made on Items 1A, 1B, 1C, the unfired cartridges, were inconclusive due to insufficient class and individual microscopic characteristics. Comparisons between the tool mark on Item 2, the unfired cartridge, and</p>   |

TABLE 2

| WebCode | Conclusions  |
|---------|--|
| YQ98XC  | tool marks made on Item 3, the unfired cartridge, were inconclusive due to insufficient class and individual microscopic characteristics.  |
| ZJK7V6  | The submitted reloaded cartridges, items 1 and item 3, exhibit crimp marks that were identified as having been produced by the same reloading die. Item 2 exhibits crimp marks that were produced by a second reloading die. |
|         | Items 1, 2 and 3 were reloaded by the same die cutting machine.  |

# Additional Comments

## TABLE 3

| WebCode | Additional Comments  |
|---------|--|
| 4FPMHW  | Examination of ammunition is not undertaken by tool mark examiners within our organisation and hence our staff are not fully familiar the process of reloading ammunition or the tools utilised for this purpose. Participation in the test was therefore undertaken by applying the standard laboratory examination protocols to a new situation as a learning opportunity and to further test the basic principles of our methodology. The detail observed on the cartridges in Items 1 and 3 from which the above association was formed was absent from the first reloaded cartridge (Item 2) and there was detail to the body of Item 2 not seen on the other cartridges. In the absence of the tool(s) to further investigate whether the observed differences were a result of the use of a different die the results in respect of item 2 were reported as inconclusive as a categorical exclusion was not considered appropriate.   |
| 4GHFDE  | Inconclusive result was due to agreement of all discernible class characteristics but insufficient agreement of individual characteristics for identification or elimination.  |
| 6JTH4K  | Item 1B (CTS #2) is an elimination; however, per unit policy analysts can only report an elimination when there is a difference in class characteristics. Therefore, this case was reported as an inconclusive.  |
| 6LUKPF  | Some markings around the mouth of the cartridge case were in agreement; however, not enough fine characteristics.  |
| 73YC9V  | Methods: Pattern Examination. Toolmarks, whether they are present on evidence items or secondary evidence created in the Laboratory, undergo two stages of comparison. First, the class characteristics are reviewed and compared. If the class characteristics of the toolmarks are not clearly different, the examination moves to a second stage using comparative microscopy. A microscopic comparison examination consists of a search of the impressed and striated marks present in two toolmarks to determine if patterns of similarity exist. At the completion of these comparisons, one of the following three opinions is issued: 1). Source Exclusion: Source exclusion is an Examiner's conclusion that two toolmarks did not originate from the same source. This conclusion is an Examiner's opinion that the observed difference(s) in class characteristics provides extremely strong support for the proposition that the two toolmarks came from different sources and extremely weak or no support for the proposition that the two toolmarks came from the same source. A source exclusion based on a minor difference in measured class characteristics requires a verification. 2). Source Identification: Source identification is an Examiner's conclusion that two toolmarks originated from the same source. This conclusion is an Examiner's opinion that all observed class characteristics are in agreement and the quality and quantity of corresponding individual characteristics is such that the Examiner would not expect to find that same combination of individual characteristics repeated in another source. The basis for a source identification conclusion is an Examiner's opinion that the observed class characteristics and corresponding individual characteristics provide extremely strong support for the proposition that the two toolmarks originated from the same source and extremely weak support for the proposition that the two toolmarks originated from different sources. A source identification requires a verification and is the Examiner's opinion that the probability that the two toolmarks were made by different sources is so small that it is negligible. 3). Inconclusive (No Conclusion): Inconclusive is an Examiner's conclusion that all observed class characteristics are in agreement but there is insufficient quality and/or quantity of corresponding individual characteristics such that the Examiner is unable to identify or exclude the two toolmarks as having originated from the same source. This conclusion is an Examiner's opinion that there is an insufficient quality and/or quantity of individual characteristics to identify or exclude. Reasons for an inconclusive conclusion include the presence of microscopic similarity that is insufficient to form the conclusion of source identification, or a lack of any observed microscopic similarity. Pattern Examination: Firearms/Toolmark Identification is an empirical science that relies on objective measurements and a subjective comparison of microscopic marks of value. Due to variation in substrate, changes in tool working surfaces from wear, corrosion, and damage, or the employment of unusual tool/work piece orientations, it may not be possible for an Examiner to reach a source conclusion. Additionally, some tool manufacturing methods routinely produce working surfaces that leave limited microscopic marks of value. Damaged, corroded, or fragmented items may be of little or no value for comparison purposes. |
| 7DY3NC  | Item 1.2 could neither be identified nor eliminated as having been reloaded with the same reloading die  |



TABLE 3

| WebCode | Additional Comments   |
|---------|---|
|         | as the cartridges from Items 1.1 and 1.3. Reloading marks are not present on the bullet and the marks around the mouth of the cartridge case are not reproduced well enough for an identification. No other reloading marks on the cartridge are useful for comparison.   |
| 8W43DN  | Item #2 was inconclusive due to lack of sufficient individual markings.   |
| 9N9GKV  | Although there were some areas that had minor agreement, there was not enough for an identification or an elimination. There were consistent class characteristics between the known reloaded cartridges (K1) and Q2 (item 003); however there was insufficient agreement/disagreement of individual characteristics along the areas of interest such as the bearing surfaces of the cartridge case, the nose of the projectile, and the rim/shoulder surfaces of the cartridge case.   |
| 9XTNJJ  | The availability of only one cartridge from what is likely a second reloading press, along with possible variances due to +P vs non+P ammunition and lack of access to the press itself and knowledge of how many cartridges were reloaded using the resizing die and bullet crimp and wear to the die results in the inconclusive opinion.   |
| AD7HCL  | Item #2 did not possess sufficient reproducing individual markings to determine an identification, or elimination as to having been reloaded using the same reloading die as Items #1 and #2 and was determined to be inconclusive.   |
| AGPF2B  | Insufficient agreement of individual characteristics.   |
| BJP4VR  | Prior to the toolmarks study, known and unknown items were physically identified using masking tape label with their subdivision (known 1.1, 1.2, 1.3) and their evidence number (unknown 2 and 3) according to the lab's best practices.   |
| BK4AG9  | Without the complete set of questioned tools, toolmarks cannot be attributed to specific reloading dies and therefore no ELIM can be made.  |
| BRFN2P  | Methods: Pattern Examination: Toolmarks, whether they are present on evidence items or secondary evidence created in the Laboratory, undergo two stages of comparison. First, the class characteristics are reviewed and compared. If the class characteristics of the toolmarks are not clearly different, the examination moves to a second stage using comparative microscopy. A microscopic comparison examination consists of a search of the impressed and striated marks present in two toolmarks to determine if patterns of similarity exist. At the completion of these comparisons, one of the following three opinions is issued: 1). Source Exclusion: Source exclusion is an Examiner's conclusion that two toolmarks did not originate from the same source. This conclusion is an Examiner's opinion that the observed difference(s) in class characteristics provides extremely strong support for the proposition that the two toolmarks came from different sources and extremely weak or no support for the proposition that the two toolmarks came from the same source. A source exclusion based on a minor difference in measured class characteristics requires a verification. 2). Source Identification: Source identification is an Examiner's conclusion that two toolmarks originated from the same source. This conclusion is an Examiner's opinion that all observed class characteristics are in agreement and the quality and quantity of corresponding individual characteristics is such that the Examiner would not expect to find that same combination of individual characteristics repeated in another source. The basis for a source identification conclusion is an Examiner's opinion that the observed class characteristics and corresponding individual characteristics provide extremely strong support for the proposition that the two toolmarks originated from the same source and extremely weak support for the proposition that the two toolmarks originated from different sources. A source identification requires a verification and is the Examiner's opinion that the probability that the two toolmarks were made by different sources is so small that it is negligible. 3). Inconclusive (No Conclusion): Inconclusive is an Examiner's conclusion that all observed class characteristics are in agreement but there is insufficient quality and/or quantity of corresponding individual characteristics such that the Examiner is unable to identify or exclude the two toolmarks as having originated from the same source. This conclusion is an Examiner's opinion that there is an insufficient quality and/or quantity of individual characteristics to identify or exclude. Reasons for an inconclusive conclusion include the presence of microscopic similarity that is insufficient to form the conclusion of source identification, or a lack of any observed microscopic similarity. Limitations: Pattern Examination: Firearms/Toolmark Identification is an empirical science that relies on objective measurements and a subjective comparison of microscopic marks of value. Due to variation in substrate, changes in tool working surfaces from wear, corrosion, and damage, or the employment of |

TABLE 3

| WebCode | Additional Comments   |
|---------|---|
|         | unusual tool/work piece orientations, it may not be possible for an Examiner to reach a source conclusion. Additionally, some tool manufacturing methods routinely produce working surfaces that leave limited microscopic marks of value. Damaged, corroded, or fragmented items may be of little or no value for comparison purposes.   |
| BRGLAZ  | Item 2 was compared to reloading marks on Item 1, and although all class characteristics were similar, there was insufficient agreement of individual marks to make an identification. Therefore, the result is inconclusive.   |
| CJ6P39  | Toolmarks observed on Exhibits 1 and 3 at base of bullet were not observed as significantly on Exhibit 2. Toolmarks observed on Exhibit 2 cartridge case near mouth were not observed as significantly on Exhibits 1 and 3. Differences observed may be due to a difference in the cartridge cases (9mm +P Luger headstamp vs 9mm Luger headstamp) or manufacturing process. Technical Notes: Class characteristics are defined as measurable features of a firearm/tool which indicate a restricted group source. They result from design features and are determined prior to manufacture of the firearm/tool. Individual characteristics are defined as marks produced by the random imperfections or irregularities of firearm/tool surfaces. These random imperfections or irregularities are produced incidental to manufacture and/or caused by use, corrosion, or damage, and are unique to that specific tool. Any conclusions indicating that a toolmark was made by a specific firearm/tool are not to the absolute exclusion of all other firearms/tools because it is not feasible to examine all possible firearms/tools. However, observing this amount of agreement from a different source is considered extremely remote.   |
| CQ4EJC  | In the areas of discernible class characteristics that were present on both Items 1 and 2, there was agreement of class with disagreement of individual characteristics, but insufficient for an elimination. Without a tool (no tool submitted) to produce more test marks to determine length of consistency of reproducibility of marks like those on Item 1, an elimination was not effected. It was not possible to produce more test marks for further comparison.  |
| D86BL9  | Only a small part of striation marks were in an agreement between the first reloaded cartridge recovered from the scene (questioned) Item 2 and the three reloaded cartridges recovered from the suspect's residence (known) Item 1. However, it is insufficient to conclusively make an identification or elimination.   |
| DMY36N  | Methods: Physical and Visual Examinations: Physical and visual evaluations compare the physical and class characteristics of evidence items. A conclusion of "physically consistent with" is reached if the observable or measurable physical dimensions and/or design features of two items are in agreement or are "physically consistent." If these dimensions and features are clearly different, an elimination conclusion is reached. If there is a lack of observable design features or measurable dimensions, the result is inconclusive. Pattern Examination: Toolmarks, whether they are present on evidence items or secondary evidence created in the Laboratory, undergo two stages of comparison. First, the class characteristics are reviewed and compared. If the class characteristics of the toolmarks are not clearly different, the examination moves to a second stage using comparative microscopy. A microscopic comparison examination consists of a search of the impressed and striated marks present in two toolmarks to determine if patterns of similarity exist. At the completion of these comparisons, one of the following three opinions is issued: 1). Source Exclusion: Source exclusion is an Examiner's conclusion that two toolmarks did not originate from the same source. This conclusion is an Examiner's opinion that the observed difference(s) in class characteristics provides extremely strong support for the proposition that the two toolmarks came from different sources and extremely weak or no support for the proposition that the two toolmarks came from the same source. A source exclusion based on a minor difference in measured class characteristics requires a verification. 2). Source Identification: Source identification is an Examiner's conclusion that two toolmarks originated from the same source. This conclusion is an Examiner's opinion that all observed class characteristics are in agreement and the quality and quantity of corresponding individual characteristics is such that the Examiner would not expect to find that same combination of individual characteristics repeated in another source. The basis for a source identification conclusion is an Examiner's opinion that the observed class characteristics and corresponding individual characteristics provide extremely strong support for the proposition that the two toolmarks originated from the same source and extremely weak support for the proposition that the two toolmarks originated from different sources. A source identification requires a verification and is the Examiner's opinion that the probability that the two toolmarks were made by different sources is so small |

## TABLE 3

| WebCode | Additional Comments   |
|---------|---|
| F7N2JL  | <p>that it is negligible. 3). Inconclusive (No Conclusion): Inconclusive is an Examiner's conclusion that all observed class characteristics are in agreement but there is insufficient quality and/or quantity of corresponding individual characteristics such that the Examiner is unable to identify or exclude the two toolmarks as having originated from the same source. This conclusion is an Examiner's opinion that there is an insufficient quality and/or quantity of individual characteristics to identify or exclude. Reasons for an inconclusive conclusion include the presence of microscopic similarity that is insufficient to form the conclusion of source identification, or a lack of any observed microscopic similarity. Limitations: Physical and Visual Examinations: A Physical and Visual Evaluation examination is unsuitable for determining a source identification conclusion. A conclusion of "physically consistent with" signifies a restricted group source, based on class characteristics and/or observable features, from which evidence may have originated. Post-manufacture features cannot be used for elimination purposes. Pattern Examination: Firearms/Toolmark Identification is an empirical science that relies on objective measurements and a subjective comparison of microscopic marks of value. Due to variation in substrate, changes in tool working surfaces from wear, corrosion, and damage, or the employment of unusual tool/work piece orientations, it may not be possible for an Examiner to reach a source conclusion. Additionally, some tool manufacturing methods routinely produce working surfaces that leave limited microscopic marks of value. Damaged, corroded, or fragmented items may be of little or no value for comparison purposes.</p> <p>Methods: Physical and Visual Examinations: Physical and visual evaluations compare the physical and class characteristics of evidence items. A conclusion of "physically consistent with" is reached if the observable or measurable physical dimensions and/or design features of two items are in agreement or are "physically consistent." If these dimensions and features are clearly different, an elimination conclusion is reached. If there is a lack of observable design features or measurable dimensions, the result is inconclusive. Pattern Examination: Toolmarks, whether they are present on evidence items or secondary evidence created in the Laboratory, undergo two stages of comparison. First, the class characteristics are reviewed and compared. If the class characteristics of the toolmarks are not clearly different, the examination moves to a second stage using comparative microscopy. A microscopic comparison examination consists of a search of the impressed and striated marks present in two toolmarks to determine if patterns of similarity exist. At the completion of these comparisons, one of the following three opinions is issued: 1). Source Exclusion: Source exclusion is an Examiner's conclusion that two toolmarks did not originate from the same source. This conclusion is an Examiner's opinion that the observed difference(s) in class characteristics provides extremely strong support for the proposition that the two toolmarks came from different sources and extremely weak or no support for the proposition that the two toolmarks came from the same source. A source exclusion based on a minor difference in measured class characteristics requires a verification. 2). Source Identification: Source identification is an Examiner's conclusion that two toolmarks originated from the same source. This conclusion is an Examiner's opinion that all observed class characteristics are in agreement and the quality and quantity of corresponding individual characteristics is such that the Examiner would not expect to find that same combination of individual characteristics repeated in another source. The basis for a source identification conclusion is an Examiner's opinion that the observed class characteristics and corresponding individual characteristics provide extremely strong support for the proposition that the two toolmarks originated from the same source and extremely weak support for the proposition that the two toolmarks originated from different sources. A source identification requires a verification and is the Examiner's opinion that the probability that the two toolmarks were made by different sources is so small that it is negligible. 3). Inconclusive (No Conclusion): Inconclusive is an Examiner's conclusion that all observed class characteristics are in agreement but there is insufficient quality and/or quantity of corresponding individual characteristics such that the Examiner is unable to identify or exclude the two toolmarks as having originated from the same source. This conclusion is an Examiner's opinion that there is an insufficient quality and/or quantity of individual characteristics to identify or exclude. Reasons for an inconclusive conclusion include the presence of microscopic similarity that is insufficient to form the conclusion of source identification, or a lack of any observed microscopic similarity. Limitations: Physical and Visual Examinations: A Physical and Visual Evaluation examination is unsuitable for determining a source identification conclusion. A conclusion of "physically consistent with" signifies a restricted group source, based on class characteristics and/or observable features, from which evidence may have originated. Post-manufacture features cannot be used for elimination purposes. Pattern</p> |

TABLE 3

| WebCode | Additional Comments  |
|---------|--|
|         | Examination: Firearms/Toolmark Identification is an empirical science that relies on objective measurements and a subjective comparison of microscopic marks of value. Due to variation in substrate, changes in tool working surfaces from wear, corrosion, and damage, or the employment of unusual tool/work piece orientations, it may not be possible for an Examiner to reach a source conclusion. Additionally, some tool manufacturing methods routinely produce working surfaces that leave limited microscopic marks of value. Damaged, corroded, or fragmented items may be of little or no value for comparison purposes.  |
| FCQ82A  | Item #1-2 was microscopically compared to item #1-1 and found to have similar characteristics; however, the comparison was inconclusive due to insufficient agreement or disagreement of individual characteristics and small sample size.   |
| GRKWW7  | Inconclusive Item 2, which has fine parallel impressed marks on the case mouth, could have been eliminated from Items 1 and 3. Although Item 2 has more dissimilarities than similarities in characteristics when compared to Items 1 and 3, the dissimilarities were not sufficient to support further elimination as random similarities were also observed. Also, the bullet has no markings of value for comparison which further prevents me from making an elimination.  |
| GRZDPD  | The answer to Question 1 in regards to Item 1 and Item 3 is based on the identification of toolmarks around the perimeter on the mouth of the unprimed cartridges. Without the tool in question it can only be determined that these marks were created by the same tool, and not necessarily by the reloading die mentioned in the question. Due to the inability to establish the reproducibility of the individual detail exhibited within the toolmarks on Item 2, and due to the lack of a tool to examine; Item 2 is inconclusive to Items 1 and 3. In the future please provide the tool or pictures of the tool for toolmark tests. It may be helpful to indicate which area you would like examined/compared.   |
| GTU7KW  | 1. Practical Certainty: Since it is not possible to collect and examine samples of all tools, it is not possible to make an identification with absolute certainty. However all scientific research and testing to date and the continuous inability to disprove the principles of toolmark analysis have demonstrated that tools produce unique, identifiable characteristics which allow examiners to reliably make identifications. Firearms/Toolmark Identification is an empirical science that relies on objective observations and a subjective interpretation of microscopic marks of value. Why Inconclusive? The differences observed on Item 2, could potentially be explained by: a different die was used or the same die (used on Item 1) was used in a different orientation. |
| GXPV24  | Inconclusive conclusion for Exhibit 2 due to agreement of class characteristics and insufficient agreement of individual characteristics (some agreement present in crimp marks, some disagreement present in crimp marks, bullet seating did not reproduce well on Exhibit 2).  |
| HVDDL6  | Sufficient agreement is related to the significant duplication of random toolmarks as evidenced by a pattern or combination of patterns of surface contours. "Sufficient agreement" exists between two toolmarks means that the agreement is of a quantity and quality that the likelihood another tool could have made the mark is so remote as to be considered a practical impossibility.   |
| J6X78Z  | Within the striated reloading marks found on the mouth of the cartridge case and the bullet jacket near the cartridge case mouth, the class characteristics match and there are small portion of striated individual characteristics that agree, which prevents elimination. However, there is not a sufficient agreement of these individual characteristics which prevents an identification. In addition, there are no cartridges with reloading marks that have sufficient agreement with Item 2, thus repeatability of the individual characteristics of Item 2 could not be established.   |
| JNCKPV  | Reproducibility of the striated marks on the three cartridges in Item 1 was quite poor, even though it was known they had been reloaded using the same equipment. Nonetheless, enough microscopic correspondence could be found on them to identify Item 3 as having been reloaded by the same equipment. Item 2 could be eliminated as there was none of this same correspondence present.  |
| JUFPET  | There are insufficient differences in individual marks for exclusion of Item 2, however the absence of the crimp marks found on Item 1a,b,c and Item 3 indicates that Item 2 was crimped by a different die.   |
| K6FFZ2  | The comparison of the toolmarks on item 1-2-1 cartridge to the toolmarks on a known cartridge from item 1-1-1 was inconclusive, in the opinion of the laboratory. Some limited agreement in the patterns of microscopic markings was observed between the compared items, however, that agreement was  |

TABLE 3

| WebCode | Additional Comments   |
|---------|---|
|         | insufficient for a conclusion of identification.  |
| KHGDJR  | The toolmarks found on the reloaded cartridge (Item 2) have similar class characteristics; however, there is a lack of individual characteristics. The bulge around the mouth on the casing of Item 2 appears to be smaller than the known cartridges (Item 1). There is a lack of marking on the projectile and the side wall of the casing which repeat on the known reloaded cartridges (item 1).  |
| L69P99  | I have answered "yes" to Item 3 but that needs further explanation...I have no way to determine that the mark associated between the three unprimed cartridges from Item 1 and the unprimed cartridge from Item 3 were made by a "reloading die" as no reloading die was submitted for comparison purposes. The toolmarks present on Items 1 and 3 were made by the same tool but without a tool submitted to compare to this mark I am unable to determine its precise origin. Additionally, the toolmark present on Item 2 is not associated with any other marks on the samples provided, but is in the same general areas as the others observed. The marks exhibit similar class characteristics and absent the ability to associate this mark with another mark in the samples or another tool (allowing you to establish reproducibility), this result is inconclusive. In my opinion, this test is poorly designed and the question posed is poorly written. These issues could have easily been addressed in the pre-distribution testing process.   |
| LK48X8  | The 9mm Luger cartridge (item 2) could not be conclusively identified or excluded as having been assembled by the same reloading die as the three 9mm Luger cartridges (item 1). There was agreement of all discernible class characteristics, but no significant agreement or disagreement of the individual characteristics was noted. The 9mm Luger cartridge (item 2) could have been assembled by the same reloading die as the three 9mm Luger cartridges (item 1) or any other reloading die with similar characteristics.   |
| MNHAFW  | Item 2 could not be identified or eliminated as having been marked by the same reloading die tool that marked Item 1 due to the lack of individual characteristics on bullet and insufficient agreement of individual characteristics on cartridge cases.   |
| MXTB2X  | Exhibit 2 has some reproducible detail; however, there is insufficient reproducible detail to determine whether it was or was not reloaded by the same reloading dies.  |
| PUELPY  | Item 2 Inconclusive. Can not eliminate Item 2 without directly examining the operation of the suspect tool.   |
| QNPMBV  | Agreement in available class characteristics but a lack of consistent and repeatable individual marks.  |
| QYAWZP  | Reloaded cartridges from Item 1 were compared to each other. Following these comparisons, circular lines around the tip of the bullet and around the lip of the case were observed in agreement between the three cartridges from item 1. The features are due to the reloading die surface pushing the bullet down into the case and the tightening the case around the bullet. These features were compared between Item 1 and Item 2. No agreement has been observed. If we assume that these cartridges were prepared in a short time period and that the tool surface did not change significantly during that period, it is our opinion that we can exclude the reloading die used to manufacture Item 1 also produce Item 2. Indeed, the differences observed are significant and, given the above-assumption, cannot be explained other than by a difference of source. It is our conclusion that the cartridge item 2 has been prepared with a different set of reloading tools than the tools used for the cartridges item 1. The same features were compared between Item 1 and Item 3. They were found in agreement in terms of shapes, striations and relative positions. We have made no observation that would indicate that different tools were used to prepare these cartridges. However, we are lacking information and data about the reloading die and the variability of toolmarks different reloading dies could leave. We are thus not in a position to assess the strength of the agreement that we have observed. The observations do provide support for the view that the same tools has been used (as opposed to different tools), but without any further investigation and data gathering, we cannot say how much support our observations provide towards that view. It is in that sense that we concluded to conclusive. |
| RV7HUB  | Pattern Examination: Toolmarks, whether they are present on evidence items or secondary evidence created in the Laboratory, undergo two stages of comparison. First, the class characteristics are reviewed and compared. If the class characteristics of the toolmarks are not clearly different, the examination moves to a second stage using comparative microscopy. A microscopic comparison examination consists of a search of the impressed and striated marks present in two toolmarks to  |

## TABLE 3

| WebCode | Additional Comments   |
|---------|---|
| U9PKP8  | <p>determine if patterns of similarity exist. At the completion of these comparisons, one of the following three opinions is issued: 1). Source Exclusion: Source exclusion is an Examiner's conclusion that two toolmarks did not originate from the same source. This conclusion is an Examiner's opinion that the observed difference(s) in class characteristics provides extremely strong support for the proposition that the two toolmarks came from different sources and extremely weak or no support for the proposition that the two toolmarks came from the same source. A source exclusion based on a minor difference in measured class characteristics requires a verification. 2). Source Identification: Source identification is an Examiner's conclusion that two toolmarks originated from the same source. This conclusion is an Examiner's opinion that all observed class characteristics are in agreement and the quality and quantity of corresponding individual characteristics is such that the Examiner would not expect to find that same combination of individual characteristics repeated in another source. The basis for a source identification conclusion is an Examiner's opinion that the observed class characteristics and corresponding individual characteristics provide extremely strong support for the proposition that the two toolmarks originated from the same source and extremely weak support for the proposition that the two toolmarks originated from different sources. A source identification requires a verification and is the Examiner's opinion that the probability that the two toolmarks were made by different sources is so small that it is negligible. 3). Inconclusive (No Conclusion): Inconclusive is an Examiner's conclusion that all observed class characteristics are in agreement but there is insufficient quality and/or quantity of corresponding individual characteristics such that the Examiner is unable to identify or exclude the two toolmarks as having originated from the same source. This conclusion is an Examiner's opinion that there is an insufficient quality and/or quantity of individual characteristics to identify or exclude. Reasons for an inconclusive conclusion include the presence of microscopic similarity that is insufficient to form the conclusion of source identification, or a lack of any observed microscopic similarity. Limitations: Pattern Examination: Firearms/Toolmark Identification is an empirical science that relies on objective measurements and a subjective comparison of microscopic marks of value. Due to variation in substrate, changes in tool working surfaces from wear, corrosion, and damage, or the employment of unusual tool/work piece orientations, it may not be possible for an Examiner to reach a source conclusion. Additionally, some tool manufacturing methods routinely produce working surfaces that leave limited microscopic marks of value. Damaged, corroded, or fragmented items may be of little or no value for comparison purposes.</p> <p>Methods: Pattern Examination. Toolmarks, whether they are present on evidence items or secondary evidence created in the Laboratory, undergo two stages of comparison. First, the class characteristics are reviewed and compared. If the class characteristics of the toolmarks are not clearly different, the examination moves to a second stage using comparative microscopy. A microscopic comparison examination consists of a search of the impressed and striated marks present in two toolmarks to determine if patterns of similarity exist. At the completion of these comparisons, one of the following three opinions is issued: 1). Source Exclusion: Source exclusion is an Examiner's conclusion that two toolmarks did not originate from the same source. This conclusion is an Examiner's opinion that the observed difference(s) in class characteristics provides extremely strong support for the proposition that the two toolmarks came from different sources and extremely weak or no support for the proposition that the two toolmarks came from the same source. A source exclusion based on a minor difference in measured class characteristics requires a verification. 2). Source Identification: Source identification is an Examiner's conclusion that two toolmarks originated from the same source. This conclusion is an Examiner's opinion that all observed class characteristics are in agreement and the quality and quantity of corresponding individual characteristics is such that the Examiner would not expect to find that same combination of individual characteristics repeated in another source. The basis for a source identification conclusion is an Examiner's opinion that the observed class characteristics and corresponding individual characteristics provide extremely strong support for the proposition that the two toolmarks originated from the same source and extremely weak support for the proposition that the two toolmarks originated from different sources. A source identification requires a verification and is the Examiner's opinion that the probability that the two toolmarks were made by different sources is so small that it is negligible. 3). Inconclusive (No Conclusion): Inconclusive is an Examiner's conclusion that all observed class characteristics are in agreement but there is insufficient quality and/or quantity of corresponding individual characteristics such that the Examiner is unable to identify or exclude the two toolmarks as having originated from the same source. This conclusion is an Examiner's opinion that</p> |

TABLE 3

| WebCode | Additional Comments  |
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|         | there is an insufficient quality and/or quantity of individual characteristics to identify or exclude. Reasons for an inconclusive conclusion include the presence of microscopic similarity that is insufficient to form the conclusion of source identification, or a lack of any observed microscopic similarity. Pattern Examination: Firearms/Toolmark Identification is an empirical science that relies on objective measurements and a subjective comparison of microscopic marks of value. Due to variation in substrate, changes in tool working surfaces from wear, corrosion, and damage, or the employment of unusual tool/work piece orientations, it may not be possible for an Examiner to reach a source conclusion. Additionally, some tool manufacturing methods routinely produce working surfaces that leave limited microscopic marks of value. Damaged, corroded, or fragmented items may be of little or no value for comparison purposes.   |
| UKWXGT  | The toolmarks observed on Item 1 exhibit the same discernable class characteristics as those present on Item 2; however, because of the lack of sufficient suitable corresponding microscopic markings, it is not possible to identify or eliminate the toolmarks on the items 1 and 2 as having been produced by the same tool.   |
| V6ZX86  | On visual inspection, one gets the impression that the bullets and the cases were not quite centered when assembled. The eccentricity of the "Item 1" and "Item 3" cartridges appears to be greater than that of the "Item 2" cartridge: the cases of Items 1 and 3 "bulge" significantly more than those of the Item 2 cartridge. The traces found at the transition from the bullet to the case were primarily used for comparison. These traces were compared by means of "BalScan". With the digital microscope, round traces were found in the area of the bullet noses. For items 1 and 3, 2 parallel grooves can be seen, for the bullet of item 2 there are 3.   |
| VNAUMU  | Item 2 is inconclusive because it failed to reveal sufficient quantity and quality of individual characteristics to determine whether or not the tool marks were created by same tools that were used to create the tool marks on the Starline cartridges (Items 1, 1A, 1B and 3).   |
| WFELCQ  | seating marks on Item 3 are not as pronounced as the seating marks on Items 1 and 3; could be due to different force applied or could be a different tool since only one (1) cartridge with marks not as pronounced will not eliminate.  |
| X8ZNQP  | I see no indication that the same crimping die or bullet seating die used to reload Items 1 and 3 were used to reload Item 2; however, without access to the suspect's reloading tools and due to the various factors affecting the production of toolmarks, I do not feel comfortable eliminating Item 2 as having been reloaded with the same dies as Item 1 and 3.  |
| XBKU6   | Inconclusive range elimination for Item 2 due to microscopic differences not being gross, and limited reproducibility information for possible second tool.  |
| XJT84A  | An inconclusive result was nominated for the Item 3 case. This conclusion was made because the examiner did not have the tool to examine, as explained in the Conclusion (part 2) above. This examiner does not have any experience with the direct examination of reloading dies for the purpose of answering the subclass versus individual characteristics question. Therefore, the examiner believes that the Inconclusive response is the most applicable in this situation.  |
| XQBHEP  | Toolmarks were observed on the Item 01-04 (agency Item 2) cartridge case with seated bullet, but were neither in agreement or disagreement with those observed on the other items. Because no agreement of individual characteristics could be established to warrant an identification, and no conflicting class or individual characteristics could be established to warrant an elimination, an inconclusive determination was made. Please also note that I consider this to be a very poor test. First of all, CTS provides an entirely separate Firearms Proficiency test, which our laboratory system also utilizes. The reloading toolmarks that are the subject of this test could easily be considered as a proficiency test in the Firearms discipline. Toolmark proficiencies are purchased to test competence in the Toolmarks discipline. The use of cartridges as the medium in a toolmark proficiency frankly seems lazy. I for one, do not look forward to the possibility of defending this test as a toolmark proficiency in the courts (should that occur) to establish our yearly requirement to be proficiency tested in the discipline, and I'm disappointed CTS may have put me in such a position. The test preparation is haphazard, since the items are not truly cartridges as they lack both primers and power (which I understand is a safety concern and were omitted for this reason, but this complicates the evidence description if treated like actual casework). Additionally, "finding three cartridges" at the scene does not qualify them as "Knowns from a particular |

TABLE 3

| WebCode | Additional Comments   |
|---------|---|
|         | <p>tool", and they would be treated as additional unknowns in most labs, as they were treated by this analyst. Also lazy is the phrasing of the test question. Asking if the toolmarks were generated by a reloading die (as opposed to looser wording such as "with the same reloading tool(s)") limits the comparison to one element of reloading whereas multiple reloading tools might be involved from trimmers, to deburrers, to crimpers. While it's true some presses do all the necessary processes without the need of those tools and in many cases those additional steps may not be necessary, no information on the reloading equipment is given and the analyst is left with having to make gross assumptions. Also, while it may be presumed the cartridge cases are pristine and never fired, that information is also not provided. Nor is the number of times these cartridges may have been reloaded previously. Additionally, the inability of the examiner to document manufacturing marks present on the cartridges BEFORE they are turned into known exemplars requires yet another assumption to be made by the examiner as to source of marks present on the exemplars. While it's certainly true not all of this information is likely to be known in real casework, the arbitrary limitation placed on the analyst by providing exemplars rather than the reloading tool itself, makes it utterly impossible for an analyst, treating this as actual casework, to provide an scientifically backed answer. Only proceeding on this test with the knowledge that it is a test, and therefore any toolmarks observed can be assumed to be attributed to a specific (and not provided) tool, can an answer be given. I understand providing a reloading press and die is not feasible, but again, reloading marks on cartridges is a poor medium for a toolmark proficiency in the first place. All of this seems like very lazy test preparation. Honestly, generation of the "Knowns" from a submitted tool is likely the most important aspect to be tested in toolmark proficiencies, which is entirely bypassed by this subpar test. This test feels like a poorly veiled money-grab. Please provide actual toolmark tests, not firearms related, with the tool provided in the future.</p> |
| XQD6V3  | <p>Identification: Is based on in the agreement of the individual characteristics observed through the microscopic comparison examination. Elimination: Is based on the disagreement of the individual characteristics observed through the microscopic comparison examination.</p>   |
| YAYLBF  | <p>Unable to confidently identify enough discernable characteristics to conclude Identification or Elimination.</p>   |

-End of Report-  
(Appendix may follow)



## Test No. 21-5281: Toolmarks Examination

DATA MUST BE SUBMITTED BY **June 14, 2021, 11:59 p.m.** TO BE INCLUDED IN THE REPORT

Participant Code: U1234A

WebCode: DCYAWW

The Accreditation Release section can be accessed by using the "Continue to Final Submission" button above. This information can be entered at any time prior to submitting to CTS.

### Scenario:

Police are investigating an armed robbery at a liquor store. Investigators recovered two unfired reloaded 9mm cartridges from the crime scene. A suspect was apprehended later that day and cartridges he was in the process of reloading were seized from his residence. Investigators are submitting a total of five cartridges (three known cartridges from the suspect's residence and two cartridges that were recovered from the crime scene) and are asking you to compare them and report your findings.

*Please note the following:*

*Each Item is in a small envelope. It is suggested that when the items are removed from their labeled envelopes, they be marked according to your laboratory procedure. However, in case the items are separated from their envelopes before labeling has occurred, each item has been marked with its item number.*

### Items Submitted (Sample Pack T1):

Item 1: Three reloaded cartridges recovered from the suspect's residence (known).

Item 2: First reloaded cartridge recovered from the scene (questioned).

Item 3: Second reloaded cartridge recovered from the scene (questioned).

**1.) Were any of the questioned reloaded cartridges (Items 2, 3) produced using the same reloading die as the reloaded cartridges recovered from the suspect's residence (Item 1)?**

|                | Yes                   | No                    | Inconclusive*         |
|----------------|-----------------------|-----------------------|-----------------------|
| <b>Item 2:</b> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| <b>Item 3:</b> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

\*Should an item(s) be marked "Inconclusive", please document the reason in the Additional Comments section of this data sheet.

*Please note: Any additional formatting applied in the free form space below will not transfer to the Summary Report and may cause your information to be illegible. This includes additional spacing and returns that present your responses in lists and tabular formats.*

**2.) What would be the wording of the Conclusions in your report?**

**3.) Additional Comments**

## RELEASE OF DATA TO ACCREDITATION BODIES

The Accreditation Release is accessed by pressing the "Continue to Final Submission" button online and can be completed at any time prior to submission to CTS.

CTS submits external proficiency test data directly to ASCLD/LAB, ANAB, and/or A2LA. Please select one of the following statements to ensure your data is handled appropriately.

- This participant's data is intended for submission to ASCLD/LAB, ANAB, and/or A2LA. (Accreditation Release section below must be completed.)
- This participant's data is **not** intended for submission to ASCLD/LAB, ANAB, and/or A2LA.

Have the laboratory's designated individual complete the following steps **only if your laboratory is accredited in this testing/calibration discipline** by one or more of the following Accreditation Bodies.

**Step 1: Provide the applicable Accreditation Certificate Number(s) for your laboratory.**

ANAB Certificate No.   
(Include ASCLD/LAB Certificate here)

A2LA Certificate No.

**Step 2: Complete the Laboratory Identifying Information in its entirety.**

Authorized Contact Person and Title

Laboratory Name

Location (City/State)