



Toolmarks Examination Test No. 23-5281 Summary Report

Each sample set contained one known diagonal cutter (Item 1) and two pieces of solder wire containing questioned toolmarks (Items 2 and 3). Participants were requested to examine these items and report their findings. Data were returned from 112 participants and are compiled into the following tables:

	<u>Page</u>
<u>Manufacturer's Information</u>	<u>2</u>
<u>Summary Comments</u>	<u>3</u>
<u>Table 1: Examination Results</u>	<u>4</u>
<u>Table 2: Conclusions</u>	<u>7</u>
<u>Table 3: Additional Comments</u>	<u>20</u>
<u>Appendix: Data Sheet</u>	

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

Each sample set contained one Pittsburgh® diagonal cutter (Item 1) and two pieces of solder wire containing questioned toolmarks (Items 2 and 3). Participants were requested to determine if any of the questioned toolmarks were made by the submitted tool. The Item 3 solder wire was cut by the Item 1 diagonal cutter. The Item 2 solder wire was cut by a different diagonal cutter that was not provided for examination.

SAMPLE PREPARATION: Paint was applied to one end of the questioned Item 2 and Item 3 pieces of solder wire to indicate which side not to examine. Item 2 was marked with blue paint and Item 3 was marked with white paint.

ITEMS 1 & 3 (IDENTIFICATION MARKS): The Item 1 diagonal cutter was used to cut the Item 3 piece of solder wire. The diagonal cutter was labeled Item 1 and packaged in bubble wrap. The Item 3 piece of solder wire was placed into a pre-labeled envelope and sealed.

ITEM 2 (ELIMINATION MARKS): The Item 2 piece of solder wire was cut by a diagonal cutter (not provided) and packaged into a pre-labeled envelope and sealed.

SAMPLE SET ASSEMBLY: The corresponding Item 1 diagonal cutter and the Item 2 and Item 3 pieces of solder wire were packaged into a pre-labeled sample set box. Two additional pieces of solder wire were included for testing purposes.

VERIFICATION: Two of the three predistribution laboratories confirmed that the Item 1 diagonal cutter produced the toolmarks on the Item 3 piece of solder wire. The remaining predistribution laboratory confirmed that the Item 1 diagonal cutter produced the toolmarks on the Item 3 piece of solder wire but reported an inconclusive for the Item 2 piece of solder wire based on the lack of corresponding individual characteristics. In addition to the sample sets examined by predistribution laboratories, ten randomly selected sample sets were verified by a qualified toolmark examiner who confirmed the expected results.

Summary Comments

This test was designed to allow participants to assess their proficiency at a toolmark examination involving pinching, striated type toolmarks. Each sample set contained one Pittsburgh diagonal cutter (Item 1) and two pieces of solder wire containing questioned toolmarks (Items 2 and 3). Participants were requested to determine if any of the questioned toolmarks were made by the submitted tool. The Item 3 piece of solder wire was cut by the Item 1 diagonal cutter. The Item 2 piece of solder wire was cut by a different diagonal cutter that was not provided for examination. (Refer to Manufacturer's Information for preparation details).

Of the 112 responding participants, 107 (96%) identified Item 3 and either eliminated or were inconclusive for Item 2 as having been cut by the Item 1 diagonal cutter. Three participants either eliminated or were inconclusive for Items 2 and 3 and two participants identified both Items 2 and 3 as having been cut by the Item 1 diagonal cutter.

Regarding Item 2, as a matter of policy, many labs will not eliminate without access to the tool or when class characteristics match. Thus, responses of inconclusive are not indicated as outliers for elimination items.

Examination Results

Did the suspect's diagonal cutter (Item 1) produce the questioned toolmarks on either of the submitted cut pieces of solder wire (Items 2 or 3)?

TABLE 1

WebCode	Item 2	Item 3	WebCode	Item 2	Item 3
29B94V	No	Yes	8A2BHX	No	Yes
2D8JNV	No	Yes	98C6XZ	No	Yes
2D8LAT	No	Yes	9AKGE3	No	Yes
2G68WP	Inc	Yes	9JMJE	No	Yes
2NP477	No	Yes	9P9R26	No	Yes
2VLACT	No	Yes	A27V4D	Inc	Yes
2XBFWP	Inc	Yes	AAFGUT	No	Yes
3328HR	No	Yes	B62YGH	No	Yes
38XP3X	No	Yes	B7T6MA	No	Yes
3YKXDZ	No	Yes	B8R6VM	No	Yes
3ZTTFR	No	Yes	BH4PWV	No	Yes
424CGZ	No	Yes	BLQCNH	Inc	Yes
4VH4BP	No	Yes	BUKAHC	Inc	Yes
6924KN	Inc	Yes	C4HNQN	Yes	Yes
6CJJUF	No	Yes	C6YUDT	No	Yes
6D9RZB	No	Yes	CJERHU	No	Yes
6L4XRQ	Inc	Yes	CLM4ZV	Inc	Yes
6NA9UL	No	Yes	DJPZX8	No	Yes
6P47XL	Inc	Yes	ED4KT2	No	Yes
6WLELJ	No	Yes	ELXQL3	No	Yes
73NMMJ	No	Yes	F8R7BN	Inc	Yes
7BXGEQ	Inc	Yes	G2XGG3	No	Yes
7MEYDP	No	Yes	G4MQLX	No	Yes

TABLE 1

WebCode	Item 2	Item 3	WebCode	Item 2	Item 3
G7W7D	No	Yes	NLJL28	No	Yes
G87KPP	Inc	Yes	NTHVLE	No	Yes
GVALUD	No	Yes	P2BND6	No	Yes
HA7B9A	No	Yes	P4GYEF	No	Yes
HADFQ8	No	Yes	P788JA	No	Yes
HCCVWA	No	Yes	PHGX4X	Inc	Yes
HFVJXA	No	Yes	Q9TA6N	No	Inc
HRMJ4J	Inc	Yes	QJR6ZY	No	Yes
HWHD2K	No	Yes	QPD3Q8	No	Yes
JLH394	No	Yes	QYGG9Y	Inc	Yes
JMVMZD	No	Yes	RAWN7	No	Yes
JUBBTU	No	Yes	RGWXY	No	Yes
K3KY9E	Inc	Yes	RNCNEX	Inc	Yes
K97WVF	No	Yes	RWT6AT	Inc	Yes
KF888Z	No	Yes	T8HK8T	No	Yes
KLC6G6	No	Yes	THAU63	No	Yes
KN2C22	Inc	Inc	TQUAH6	No	Yes
KU6HEJ	No	Yes	TWNZCV	No	Yes
L2KFHW	Inc	Yes	UD9DYM	No	Yes
L64DCE	No	Yes	UPKKW9	No	Yes
LNFXM	Inc	Yes	URPB23	No	Yes
MXG62M	No	Yes	UUEGLY	No	Yes
N777YC	No	Yes	UZJFV4	No	Yes
N7BAUN	No	No	V7PARK	No	Yes
NE3T7B	No	Yes	VCWVJN	No	Yes

TABLE 1

WebCode	Item 2	Item 3	WebCode	Item 2	Item 3
WECM7A	No	Yes			
WFLK7	Inc	Yes			
WWEAPW	Yes	Yes			
XAH3J7	No	Yes			
XBQ3YK	Inc	Yes			
XHBDU2	Inc	Yes			
XJ2MYV	No	Yes			
XQMEBV	No	Yes			
XVGAD3	Inc	Yes			
Y3R2TQ	No	Yes			
YFM2UV	No	Yes			
YRAFPH	Inc	Yes			
Z8F4AW	No	Yes			
ZCWG3W	No	Yes			
ZQECC2	No	Yes			
ZZK4V4	No	Yes			

Response Summary			Total Participants: 112	
<i>Did the suspect's diagonal cutter (Item 1) produce the questioned toolmarks on either of the submitted cut pieces of solder wire (Items 2 or 3)?</i>				
Responses		<u>ITEM 2</u>	<u>ITEM 3</u>	
	Yes	2 (1.8%)	109 (97.3%)	
	No	84 (75.0%)	1 (0.9%)	
	Inc	26 (23.2%)	2 (1.8%)	

Conclusions

TABLE 2

WebCode	Conclusions
29B94V	In my opinion Item 2 was not cut using Item 1 - CONCLUSIVE ELIMINATION. In my opinion Item 3 was cut using Item 1 - CONCLUSIVE ASSOCIATION.
2D8JNV	1. Examination of Exhibit 1 revealed one Pittsburgh brand diagonal cutter designed to be used as an opposed jaw center cut pinching type tool. Exhibit 1 was used to created Exhibit 1.1 test standards. 2. Examination of Exhibits 2 and 3 each revealed one cut nonferromagnetic solder wire displaying damage consistent with that caused by an opposed jaw center cut pinching type tool such as diagonal cutters. 3. Microscopic comparison revealed the damage on Exhibit 2 was not caused by Exhibit 1 due to sufficient disagreement of individual characteristics. Microscopic comparison revealed the damage on Exhibit 3 was caused by Exhibit 1 due to sufficient agreement of individual characteristics. TECHNICAL NOTES: Class characteristics are defined as measureable 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.
2D8LAT	Based on no exclusionary differences in class characteristics and sufficient agreement in individual characteristics, Item 3 was cut by the tool marked Item 1. Based on exclusionary differences in class characteristics, Item 2 was not cut by the tool marked Item 1.
2G68WP	Items A1-2 and A1-3 are consistent in class characteristics with the submitted diagonal cutter item A1-1. Toolmarks present on the Item A1-2 wire exhibit the same discernable class characteristics as those produced with the item A1-1 diagonal cutter; however, because of the lack of sufficient suitable corresponding microscopic markings, it was not possible to identify or eliminate the item A1-1 as having produced the toolmarks on the item A1-2 wire. The Item A1-3 toolmark was examined, compared microscopically, and identified as having been produced with the item A1-1 diagonal cutter. An Identification conclusion is based on an examiner's determination that all discernible class and individual characteristics agree such that the extent of agreement exceeds that which has been demonstrated by toolmarks made by different tools and is consistent with the agreement demonstrated by toolmarks known to have been made by the same tool.
2NP477	Item 3, the second cut piece of solder wire (marked with white paint), was cut by Item 1, the diagonal cutter recovered from the suspect's vehicle. There was sufficient agreement of surface contours and/or microscopic toolmarks on the wire for identification. Item 2, the first cut piece of solder wire (marked with blue paint), was not cut by Item 1, the diagonal cutter recovered from the suspect's vehicle. The toolmarks were different, and therefore, they were eliminated.
2VLACT	Results of Examinations: Item 1 is a Pittsburgh brand pair of diagonal cutters that uses a pinching action. Item 2 and Item 3 are pieces of solder wire that bear toolmarks consist with a pinching action. Toolmarks present on the Item 3 wire were identified as having been produced by the Item 1 diagonal cutters. Due to a difference in class characteristics, the Item 2 wire was excluded as having been cut by the Item 1 diagonal cutters.
2XBFWP	[No Conclusions Reported.]
3328HR	Item #3 (cut wire- white tip) was compared microscopically against test cut wire and identified as having been cut with the diagonal cutter, mark Item #1. Item #2 (cut wire- blue tip) was compared microscopically against test cut wire and eliminated as having been cut with the diagonal cutter, marked Item #1.
38XP3X	Tracking #[Number]. Item 1: The diagonal cutter was determined to be functional as designed. Item 2: The questioned toolmark on the solder wire was not caused by the cutting blade of the Item 1

TABLE 2

WebCode	Conclusions
	diagonal cutter. Item 3: The questioned toolmark on the solder wire was caused by the cutting blade of the Item 1 diagonal cutter.
3YKXDZ	[No Conclusions Reported.]
3ZTTFR	The item 3 section of solder wire is identified as having been cut by the item 1 diagonal cutters. The item 2 section of solder wire is eliminated as having been cut by the item 1 diagonal cutters.
424CGZ	[No Conclusions Reported.]
4VH4BP	Due to differences found in characteristics on the questioned cut surface of the item 2 (blue) and characteristics on cut surface of the suspect's diagonal cutter (item 1), the questioned toolmarks on first cut piece of solder wire (item 2-blue) were not produced with suspect's diagonal cutter (item 1). Due to corresponding characteristics found on the questioned cut surface of the item 3 (white) and characteristics on cut surface of the suspect's diagonal cutter (item 1), the questioned toolmarks on second cut piece of solder wire (item 3-white) were produced with suspect's diagonal cutter (item 1).
6924KN	Item 3 was microscopically examined and, based on corresponding class and individual characteristics, identified as having been cut by Item 1. Item 2 was microscopically examined and exhibits similar class and individual characteristics as those produced by Item 1. However, due to a lack of corresponding individual characteristics, it was not possible to identify or eliminate this item as having been cut by Item 1. Therefore, this comparison is inconclusive.
6CJJUF	As a result of my examination, I formed the opinion that the diagonal cutter listed as item 1 had cut the solder wire listed as item 3 and did not cut the solder wire listed as item 2.
6D9RZB	Item 2 was not cut by Item 1. Item 3 was cut by Item 1.
6L4XRQ	The cut sections of wire in items #2 and #3 were microscopically compared to test cuts made using the cutters submitted as item #1. The following conclusion was reached: The toolmark observed on the wire of item #2 was found to have the same class characteristics; however, the results of the comparison are inconclusive due to a lack of sufficient agreement or disagreement of individual characteristics. Item #2 cannot be identified or eliminated as having been cut by the cutters of item #1. The wire of item #3 was microscopically identified as having been cut by the cutters of item #1.
6NA9UL	Item 2 was eliminated as having been cut by the Item 1 diagonal cutter. Item 3 was microscopically identified as having been cut by the Item 1 diagonal cutter.
6P47XL	Items – Description/Visual Examination: Item 1: One (1) diagonal wire cutter with black/green grips Items 2 & 3: Two (2) pieces of cut soldering wire with straightened toolmark impressions. Examination Results: Test toolmark impressions of Item 1 were produced using stock lead wire and the provided stock soldering wire. Microscopic Comparison Conclusions: Identification: Based upon the reproducibility of class characteristics and microscopic individual characteristics, the following identifications were made: Lab Item #: Evidence Type: Conclusion: Item 3: Toolmark impressions: Created by Item 1 (diagonal wire cutters). 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 # Evidence Type Conclusion Item 2 Toolmark impressions Inconclusive as having been made by Item 1.
6WLELJ	The Item 01-03 cut soldering wire was identified as being cut by the Item 01-01 diagonal cutters. The Item 01-02 cut soldering wire was eliminated as being cut by the Item 01-01 diagonal cutters.
73NMMJ	Item 1, the submitted "PITTSBURGH" brand diagonal cutter, was examined. The cutter is designed with opposing, straight-edged blades that cut materials using a pinching action. The cutter was used to make test cuts in lead and solder wire, which were then microscopically compared. Good reproducibility of the test marks was observed, including class and individual characteristics. No potential subclass characteristics were observed on the blades. Items 2 and 3, the questioned pieces of cut solder wire, were examined. The cut ends of both items have class characteristics similar to the test cuts made by Item 1. The test marks from Item 1 were microscopically compared to Items 2 and 3. Sufficient agreement of individual characteristics was observed between the test cuts from both sides of

TABLE 2

WebCode	Conclusions
	one of the blades of Item 1 and the cuts on Item 3 to identify Item 3 as having been cut by Item 1. No significant agreement of individual characteristics was observed between the test cuts from the blades of Item 1 and the cuts on Item 2. Additionally, slight differences were observed between the profile shapes of the cut end of item 2 and those of the test cuts, which suggests a possible difference in class characteristics between item 1 and the tool responsible for the cut on item 2. Furthermore, due to the observed consistent reproduction of individual striae in the test marks produced by the blades of Item 1, it is reasonable to expect that any marks produced with these cutters would exhibit similar agreement. Therefore, based on the lack of agreement of individual characteristics, in addition to the potential differences observed in class characteristics, Item 2 was excluded as having been cut by Item 1.
7BXGEQ	Item 1 is a diagonal cutter marketed under the name Pittsburgh, which utilizes a pinching type action. Item 2 is a cut wire bearing toolmarks of value from a pinching or shearing type tool. Item 3 is a cut wire bearing toolmarks and fracture marks of value from a pinching type tool. Toolmarks present on the Item 3 wire were identified as having been produced by the Item 1 diagonal cutter. A pattern examination of toolmarks present on the Item 2 wire and Item 1 diagonal cutter was inconclusive due to insufficient quality and/or quantity of corresponding individual characteristics.
7MEYDP	The toolmarks present on the Item 2 and Item 3 metal wires were microscopically compared to tests made using the Item 1 diagonal cutter based on the agreement of class characteristics. The following was determined: The Item 1 diagonal cutter was identified as having made the questioned toolmarks on Item 3 due to sufficient agreement of individual characteristics. The Item 1 diagonal cutter was eliminated as having made the questioned toolmarks on Item 2 due to sufficient disagreement of individual characteristics. The significance of this identification is made to the practical, not absolute, exclusion of all other toolmarks.
8A2BHX	[No Conclusions Reported.]
98C6XZ	In my opinion, item #3 is identified as being cut by the submitted diagonal cutters (item 1) based on the agreement seen in the individual marks on the cut wire sample.
9AKGE3	[No Conclusions Reported.]
9JMJXE	In my opinion the profile of the cut to item 2 differs from that produced in test cuts made with item 1 and hence it is my view that this tool has not been used to cut item 2. In my opinion the correspondence between cuts produced using item 1 and the cut to item 3 in terms of the profile and the detail present is of the utmost significance. I consider the likelihood of obtaining such a correspondence as a result of mere coincidence had the tool not been used to cut item 3 to be so remote as to be discounted as a practical possibility. It is therefore my opinion that these findings demonstrate conclusively that item 1 has been used to cut item 3.
9P9R26	[No Conclusions Reported.]
A27V4D	The Item 01-02 small segment of solder wire was unable to be identified or eliminated as having been cut by the Item 01-01 diagonal cutter due to a lack of reproducible marks. The Item 01-03 small segment of solder wire was identified as having been cut by the Item 01-01 diagonal cutter.
AAFGUT	Initial visual and microscopic inspection of K1 Item 1 suspect tool (Pittsburgh Brand Diagonal Cutters) and evidence solder wire pieces (Items 2 and 3) revealed a discoloration and defect at the approximate midpoint of the tool's blade that is consistent with the diameter of the evidence solder wire received. This side of the blade was marked to denote this area prior to creating tests for comparison to evidence. The visual and microscopic analysis of the toolmarks present on evidence cut solder wire pieces Items 2 and 3 and toolmarks created with test material by K1 Item 1 suspect diagonal cutters were initiated on 6/8/2023 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 present on Item 3 solder wire were created with K1 Item 1 suspect diagonal cutters. Based on significant disagreement of individual characteristics, the toolmarks present on Item 2 solder wire were created with a different tool than K1 Item 1 diagonal cutters.
B62YGH	1. Examination of Exhibit 1 revealed it to be one pair of Pittsburgh marketed diagonal cutters with an

TABLE 2

WebCode	Conclusions
	opposed jaw, center cutting action. a. Exhibit 1 measures 107.9mm in length. b. Test standards, sub-exhibited as Exhibit 1.1, were created using Exhibit 1. 2. Examination of Exhibit 2 revealed it to be one nonferromagnetic solder wire. One end displays damage consistent with that caused by an opposed jaw, center cutting tool such as diagonal cutters. a. Exhibit 2 measures 21.59mm long and 2.91mm in diameter. b. Microscopic comparison revealed that the damage present on Exhibit 2 was not caused by Exhibit 1, due to sufficient disagreement of individual characteristics. 3. Examination of Exhibit 3 revealed one nonferromagnetic solder wire. One end displays damage consistent with that caused by an opposed jaw, center cutting tool. a. Exhibit 3 measures 27.88mm long and 2.89mm in diameter. b. Microscopic comparison revealed that the damage on Exhibit 3 was caused by Exhibit 1, due to sufficient agreement of individual characteristics. All measurements are approximate.
B7T6MA	1. The tool mark present on the cut piece of solder wire, described in item 3, was produced by the tool (diagonal cutter) described in item 1 (identification). 2. The tool mark present on the cut piece of solder wire, described in item 2, was not produced by the tool (diagonal cutter) described in item 1 (elimination).
B8R6VM	Item 1-2 was microscopically compared to test marks made by Item 1-1 and found to have different class characteristics. Item 1-2 was eliminated as having been cut by 1-1. Item 1-3 was microscopically compared to test marks made by Item 1-1 and found to have areas of corresponding individual characteristics. Item 1-3 was identified as having been cut by Item 1-1.
BH4PWV	Item 1 - Diagonal cutter recovered from the suspect's vehicle. Item 2 - First cut piece of solder wire (marked with blue paint). Item 3 - Second cut piece of solder wire (marked with white paint). Analysis Result: The item 1 diagonal cutters were examined and test toolmarks were made for future reference and comparison purposes. The test standards were compared to the item 2 and item 3 cut wires with the following results: Sufficient disagreements of individual characteristics confirmed the item 2 cut wire was not cut by the item 1 diagonal cutters. Agreements of class characteristics and sufficient agreement of individual characteristics confirmed the item 3 wire was cut with the item 1 diagonal cutters.
BLQCNH	Results: Item: 1-1 (CTS Item 1). Brand: Pittsburgh. Type: Tool - diagonal cutter. Tool Action: Pinching action. Item: 1-2-1 (CTS Item 2). Type: Piece of solder wire with toolmarks. Toolmark type: Pinching action - striated toolmarks. Toolmark suitability: Suitable. Item: 1-3-1 (CTS Item 3). Type: Piece of solder wire with toolmarks. Toolmark type: Pinching action - striated toolmarks. Toolmark suitability: Suitable. Conclusions: Based on microscopic comparisons, in the opinion of the laboratory: The toolmarks on item 1-2-1 solder wire could not be identified or eliminated as having been made by item 1-1 diagonal cutters. The inconclusive conclusion was based on an absence of agreement or disagreement in the patterns of microscopic markings for a conclusion of identification or elimination, respectively. The toolmarks on item 1-3-1 solder wire were identified as having been made by item 1-1 diagonal cutters.
BUKAHC	1. Exhibit 1 is a Pittsburgh diagonal cutter. a. Exhibit 1 was used to create the Exhibit 1.1 Test Standards. 2. Exhibit 2 is a cut piece of wire. a. Comparison revealed Exhibit 2 could not be identified or eliminated as having been cut by Exhibit 1 based on insufficient agreement or disagreement of individual characteristics. 3. Exhibit 3 is a cut piece of wire. a. Comparison revealed Exhibit 3 was cut by Exhibit 1 based on sufficient agreement of class and individual characteristics. Technical Notes: Class characteristics are defined as measureable 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.
C4HNQN	The Item 2 cut piece and Item 3 were cut by the Item 1 diagonal cutter.
C6YUDT	Items 1, 2, and 3 were examined. Items 2 and 3 were microscopically compared to tests cut by Item

TABLE 2

WebCode	Conclusions
	1. Item 2 was not cut by Item 1 based on different class characteristics and significantly different individual characteristics. Item 3 was cut by Item 1 based on the sufficient agreement of individual characteristics.
CJERHU	IDENTIFICATION: The following items were compared and were found to show the presence of matching features. The opinion of Identification is based upon the agreement of a combination of individual characteristics and all discernible class characteristics consistent with having been made by the same tool. Item 1 test marks Item 3 wire. ELIMINATION: The Item 1 diagonal cutters were eliminated as having been used to cut the Item 2 piece of wire based of differences in individual characteristics
CLM4ZV	Item 1 (a diagonal cutter) was identified ¹ as having made the toolmark on Item 3 (a piece of wire). It could not be determined if Item 1 made the toolmark on Item 2 (a piece of wire). ² 1)Source identification is reached when the discernable class and individual characteristics have corresponding detail and the examiner would not expect to see the same arrangement of details repeated in another source. 2) Because of a lack of corresponding individual characteristics, the comparative examinations were inconclusive.
DJPZX8	Item #3 - white tip wire was compared microscopically to test cut standards and identified as having been cut with the diagonal cutter, item #1. Item #2 - blue tip wire was compared microscopically to test cut standards and eliminated as having been cut with the diagonal cutter, item #1.
ED4KT2	001 = tool. 002 = no match. 003 = match. Item 001 is a pair of "clipper cut" (side cutter) wire cutters with 12mm blade length branded Pittsburgh. Item 002 and 003 are pieces of solder wire of the same gauge. On examination Item 002 was eliminated due to the style of cut. The cut has come from a centre cut style of tool and therefore Item 001 can be excluded from having produced the tool mark impression. On examination of Item 003 was deemed an identification. The impressions on Item 003 share the same type of cut as developed from Item 001 (clipper cut). The types of striations and marks made from Item 001 were reproducible and were of the same physical size and pattern of those impressions located on the cut end of Item 003. Comparison was conducted from all four blade edges of Item 001 to the two cut surfaces of Item 003. The following matches from Item 001 were made: Blade nominated as C - to wider surface cut of Item 003 Blade nominated as D - to the scooped surface cut of Item 003 Both C and D were the concave or inside tool edge blades. There was a significant correspondence between class (size / type) and individual characteristics (fine and large striations). there were no unexplained differences. Therefore Item 001 is identified as having produced the cut of Item 003 based on the correspondence of class and individual striated tool mark detail produced in tests by the tool (Item 001). In the opinion of the examiner this finding excludes other similar implements having made the mark in question.
ELXQL3	A microscopic comparison was completed between test samples produced by the exhibit diagonal cutter (Item 1), and the two cut pieces of exhibit solder wire (Item 2 and Item 3). This microscopic comparison revealed sufficient agreement of class and individual characteristics between the test sample cuts and the cut solder wire marked with the white paint (Item 3). Thus, in my opinion, the exhibit cut solder wire, Item 3, was cut by the diagonal cutter, Item 1. The microscopic comparison further revealed some agreement of class characteristics, and disagreement of individual characteristics between the test sample cuts and the cut solder wire marked with the blue paint (Item 2). Thus, in my opinion, the diagonal cutter, Item 1, was not used to cut the solder wire, Item 2.
F8R7BN	Item 1 is a diagonal cutter with the manufacture/brand name of Pittsburgh. Item 1 and 2 are pieces of wire. Toolmarks present on the Item 3 piece of wire were identified as having been produced by the Item 1 diagonal cutter. A pattern examination of toolmarks present on the Item 2 piece of wire and Item 1 diagonal cutter was inconclusive due to insufficient quality and/or quantity of corresponding individual characteristics. No examinations were performed on the Item 5 debris.
G2XGG3	Test cuts were made with the cutting tool (Item 1) in soft lead sheet and in similar wire. The patterns of striae produced by the blades showed very good reproducibility of the striae pattern when two tests from the same blade were compared. The test marks were then compared to the patterns of striae present in the cut wire (Items 2 and 3). This microscopic comparison revealed that: The cutters (Item 1) were not responsible for cutting the wire (Item 2). The cutters (Item 1) were responsible were cutting

TABLE 2

WebCode	Conclusions
	the wire (Item 3), approximately half way along the top sides of the blades.
G4MQLX	Examinations showed the tool marks present on Item 2 were not produced by Item 1. Examinations showed the tool marks present on Item 3 were produced by Item 1.
G7W7D	1) Examination of Exhibit 1 revealed one pair of Pittsburgh brand diagonal cutters (opposed blade pinching tool). The overall length is 11 cm, the blades are 14mm long and 6mm wide. 2) Exhibits 2 and 3 each contain one piece of non-ferromagnetic silver colored wire segment each 2.89mm in diameter. a. Exhibit 2 is 24mm long and Exhibit 3 is 32mm long. b. One end of each Exhibit is covered in paint (blue for Exhibit 2, white for Exhibit 3) to indicate it was cut by the submitter. The toolmarks covered in paint were not examined. c. The other end of each Exhibit (2 and 3) contains toolmarks consistent with an opposed jaw pinching tool, such as diagonal cutters. These toolmarks are suitable for microscopic comparison 3) Test standards of Exhibit 1 were created (sub-exhibited 1.1) using the wire segments provided by the submitter (similar physical characteristics as Exhibits 2 and 3). 4) Exhibits 1.1, 2 and 3 were microscopically compared: a. Toolmarks observed on Exhibit 3 were created by Exhibit 1 due to an agreement of class characteristics and sufficient agreement of individual characteristics. b. Toolmarks observed on Exhibit 2 were not created by Exhibit 1 due to an agreement of class characteristics, but a disagreement of individual characteristics. All measurements are approximate.
G87KPP	Through macroscopic/microscopic examination and based on agreement of discernible class characteristics and sufficient corresponding individual detail, the toolmarks of interest exhibited on the piece of cut wire, Laboratory Item 3, were identified as having been created by the use of the diagonal cutters, Laboratory Item 1. Based on macroscopic/microscopic examination the toolmarks of interest exhibited on the piece of cut wire, Laboratory Item 2, exhibit similar class characteristics as those displayed on test toolmarks created using the diagonal cutters, Laboratory Item 1. However, due to the lack of sufficient disagreement and limited reproducibility in individual detail, the toolmarks of interest exhibited on Laboratory Item 2 could not be eliminated as having been created by the use of the diagonal cutters, Laboratory Item 1. The results of these examinations are inconclusive.
GVALUD	The cut wire (item #3 - white tip) was compared microscopically against test cut wire and identified as having been cut with the diagonal cutter, item #1. The cut wire (item #2 - blue tip) was compared microscopically against test cut wire and eliminated as having been cut with diagonal cutter, item #1.
HA7B9A	Toolmark Analysis: Methodology – Physical (Visual Examination). Microscopy (Comparison Microscopy). Test marks were made with Item 1, the Pittsburgh diagonal cutters, using the submitted testing material. Item 1A, the test marks, was sealed in a manila envelope and will be returned with the evidence to the submitting agency. The tool mark on Item 3, the cut wire, was made with Item 1, the Pittsburgh diagonal cutters, based upon corresponding class and individual microscopic characteristics. The tool mark on Item 2, the cut wire, was not made with Item 1, the Pittsburgh diagonal cutters, based upon different class characteristics.
HADFQ8	The toolmark found on exhibit 3 was identified as having been made by exhibit 1, the submitted diagonal cutter. The toolmark found on exhibit 2 was not made by exhibit 1 based on differences in class and individual characteristics.
HCCVWA	Tool Mark Analysis: Methodology: Physical (Visual Examination). Microscopy (Comparison Microscope). Digital Micrometer. Test marks were made with Item 1, the diagonal cutters, using submitted testing media. Item 1A, the test marks, was sealed in a manila envelope and will be returned with the evidence to the submitting agency. The tool mark on Item 3, the silver wire, was made with Item 1, the diagonal cutters, based upon corresponding class and individual microscopic characteristics. The tool mark on Item 2, the silver wire, was not made with Item 1, the diagonal cutters, based upon different class and individual microscopic characteristics.
HFWJXA	The toolmarks found on the submitted solder wire, Exhibit 3, were identified as having been made by the submitted diagonal cutter tool, Exhibit 1. The toolmarks found on the submitted solder wire, Exhibit 2, were not made by the submitted diagonal cutter tool, Exhibit 1, based on differences in individual and class characteristics.

TABLE 2

WebCode	Conclusions
HRMJ4J	During the investigation and comparison, no reason has been found to believe that the toolmark on solder wire item 2, from the crime scene, should have been made by the diagonal cutter item 1. The diagonal cutter item 1 has been identified as having made the toolmark on the cut piece of solder wire item 3, because in the comparison agreement has been established with regard to specific details, arising from processing and wear to the egg edge of the diagonal cutter. These details are by contact between the tool and the surface transferred from the diagonal cutter to the toolmark.
HWHD2K	Item 1: Diagonal cutter recovered from the suspect's vehicle was using to cut Item 3: Second cut piece of solder wire (marked with white paint).
JLH394	Examinations showed the questioned toolmarks on Item 2 (D-1) were not produced by Item 1. Examinations showed the questioned toolmarks on Item 3 (D-2) were produced by Item 1.
JMVMZD	Item 1 - One diagonal cutter. Item 2 - One cut piece of solder wire (marked with blue paint). Item 3 - One cut piece of solder wire (marked with white paint). The submitted specimen marked as Item 1 was examined and identified as a diagonal cutter. The submitted specimens marked as Items 2 and 3 were examined and identified as two (2) cut pieces of solder wire. Toolmarks exhibited on Item 3 were microscopically compared to test marks created using Item 1. As a result of microscopic comparison, Item 3 was identified as having been cut by Item 1. It was further concluded that Item 2 was eliminated as having been cut by Item 1 based on differences in class characteristics.
JUBBTU	1. Examinations showed the tool marks on Item 3 were made by Item 1. 2. Examinations showed the tool marks on Item 2 were not made by Item 1.
K3KY9E	The piece of solderwire (item 3) was identified as having been cut by the pair of diagonal cutters (item 1). Agreement of the characteristics is sufficient to determine that the diagonal cutters are the source of the toolmarks on the piece of solder wire. The piece of solder wire (item 2) could not be conclusively identified or excluded as having been cut by the pair of diagonal cutters (item 1). There was agreement of all discernible class characteristics, but no significant agreement or disagreement of the individual characteristics was noted. The piece of solder wire could have been cut by the pair of diagonal cutters, or another other pair of opposing jawed cutters with similar characteristics.
K97WVF	Upon the examination, it is possible to conclude that the suspect's diagonal cutter (Item 1) did not produce the questioned toolmarks on the submitted first cut piece of solder wire (Item 2) and did produce the questioned toolmarks on the submitted second cut piece of solder wire (Item 3).
KF888Z	The striated cut marks on the solder wire in item 3 were made by the diagonal cutter in item 1. The striated cut marks on the solder wire in item 2 were not made by the diagonal cutter in item 1.
KLC6G6	Item 1 was examined and test cuts were made using solder wire submitted with Item 1. The test cuts were returned with the evidence. Item 1 was eliminated as having made the cut on Item 2. Item 1 was identified as having made the cut on Item 3. Identification is the strongest level of positive association.
KN2C22	Item 2 and Item 3 is inconclusive. Some agreement of individual characteristics and all discernible class characteristics, but insufficient for an identification. Item 2 while inconclusive, the general class characteristics were in agreement and there were some individual characteristics replicate but where insufficient to identify item 1 as having produced the marks. Item 3 was inconclusive, while the general class characteristics were similar to those of the rear of the blade. There was a lack of sufficient individual characteristics to either include or exclude it from having produced the marks.
KU6HEJ	[No Conclusions Reported.]
L2KFHW	Exhibit 3 was identified* as having been cut by the Exhibit 1 cutter. Test cuts (Exhibit 1.1) will be retained with Exhibit 1. It is inconclusive if Exhibit 2 was cut by the Exhibit 1 cutter. There is agreement of all discernible class characteristics and disagreement of individual characteristics, but insufficient for an elimination. This may be due to a lack of reproducibility or damage. *Identification: Agreement 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.

TABLE 2

WebCode	Conclusions
L64DCE	Visual and microscopic analysis of the evidence cut solder wire pieces (item 2 and item 3) and a test cut made with the diagonal cutter (item 1) were performed and the results of the comparison and evaluations are as follows: Based on agreement of discernible class characteristics and sufficient agreement of individual characteristics, the second piece of cut solder wire (item 3, white paint) is identified as having been cut with the diagonal cutter recovered from the suspect's vehicle (item 1). Based on disagreement of individual microscopic markings, the first piece of cut solder wire (item 2, blue paint) is excluded as having been cut with the diagonal cutter recovered from the suspect's vehicle (item 1).
LNFZXM	There are sufficient individual markings present to identify Item 1 (diagonal cutter) as the tool used to damage Item 3 (wire). Item 2 (wire) can neither be identified nor eliminated as having been damaged by Item 1 (diagonal cutter).
MXG62M	The wire cutter, item 1, is the source of the questioned tool mark on the wire, item 3. The wire cutter, item 1, is excluded as a possible source of the questioned tool mark on the wire, item 2.
N777YC	The Exhibit 1 diagonal cutters were used to make test toolmarks. The test toolmarks were designated as Exhibit 1.1. The Exhibit 3 metal wire toolmarks were identified as having been made by the Exhibit 1 tool. The Exhibit 2 metal wire toolmarks were excluded as having been made by the Exhibit 1 tool.
N7BAUN	Differences in shape and other sub class characteristics were noted between test cuts made by the cutter (ITEM 1) and the recovered cut wires (ITEM 2 and ITEM 3) such that the cutter is not responsible for either cut.
NE3T7B	The cut ends of the solder wires submitted as Item #2 and Item #3 were microscopically compared with test-cuts made using the diagonal cutters submitted as Item #1. There is agreement in all discernible class characteristics and sufficient agreement in individual characteristics to conclude that Item #1 was used to cut Item #3. There are significant discrepancies in most characteristics to conclude that Item #1 was not used to cut Item #2.
NLJL28	Item 2 was eliminated as having been produced by the suspect tool (Item 1). Item 3 was identified as having been produced by the suspect tool (Item 1).
NTHVLE	Results of Examinations: Item 1 is a pair of Pittsburgh brand diagonal cutters. The Item 1 diagonal cutters utilize a pinching action. Item 2 and Item 3 are two pieces of cut solder wire. Toolmarks present on the Item 3 piece of solder wire were identified as having been produced by the Item 1 diagonal cutters. The Item 2 solder wire was excluded as having been cut by the Item 1 diagonal cutters.
P2BND6	The Item 2 wire segment is eliminated as having been cut using the Item 1 diagonal cutter. The Item 3 wire segment is identified as having been cut using the Item 1 diagonal cutter.
P4GYEF	Item 1.1 is a Pittsburgh brand diagonal cutter. Items 1.2 and 1.3 are two cut pieces of wire. Tests made using Item 1.1 were microscopically compared to the cut ends of Items 1.2 and 1.3. Based on disagreement in class characteristics, Item 1.1 was eliminated as having been used to cut Item 1.2. Based on agreement of all discernible class characteristics and corresponding individual detail, Item 1.1 was identified as having been used to cut Item 1.3.
P788JA	The observations from the comparison of the diagonal cutter (item 1) with the toolmarks of item 3 strongly suggest that the diagonal cutter left these marks. On the other hand, it is excluded that the diagonal cutter (Item 1) produced the questioned toolmarks on item 2.
PHGX4X	1) Exhibit 1 is a Pittsburgh diagonal cutter consistent with being used as an opposed blade cutting tool. a) Exhibit 1 was used to create the Exhibit 1.1 test standards. 2) Exhibits 2 (metal wire) and 3 (metal wire) were physically examined and microscopically compared to test toolmarks from the Exhibit 1 diagonal cutters. a) Microscopic comparison revealed that the Exhibit 1 diagonal cutters caused the damage on the Exhibit 3 wire based on agreement of all discernible class characteristics and a sufficient agreement of individual characteristics. b) Microscopic comparison revealed that it could not be determined if the Exhibit 1 diagonal cutters caused the damage on the Exhibit 2 wire based on agreement of all discernible class characteristics but an insufficient agreement or disagreement of

TABLE 2

WebCode	Conclusions
	<p>individual characteristics. The damage on the Exhibit 2 wire is consistent with being made by an opposed blade cutting tool such as a diagonal cutter or similar tool. 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.</p>
Q9TA6N	<p>[Name] reports receiving a white box from [Name]. Box was sealed with tamper evident tape and signed CTS. A white label was on the box that read; '2023 CTS Forensic Testing Program Test No. 23-5281 : Toolmarks Examination Sample pack: T1'. The box contained a pair of wire cutters - Pittsburgh item 1. The wire cutters appeared to have been used with markings on the jaws. A piece of solder that has been cut with blue end - Item 2 . A piece of solder that has been cut with white end - Item 3 . 2x scrap pieces of solder. The cuts on 2 and 3 were set apart by the angle of the cuts, item 2 had more of a shallow angle indicating that it has come from the outer jaw where 3 has come from the inner jaw. Test cuts were made from each side of the jaw and compared to the corresponding side. Item 2 : Elimination: This finding is based on significant disagreement between discernible individual characteristics on the specific implement and the tool mark impression. Item 3: Inconclusive: The sample pieces of solder were used to create toolmarks from the entire length of the jaws. In addition, two toolmarks were taken from the same part of the jaws and compared to see if the test can be reproduced. When compared, the Consecutive Matching Striae (CMS) criteria was low (less than 2x3 or one set of 6) making the reproduction test inconclusive. That being said, each toolmarks were compared section by section with item 3, concluding that the detail available for comparison is such that the implement cannot be either excluded or identified as the source of the toolmark impression. The inconclusive finding may nominate the implement as capable of having produced the toolmark but does not exclude other similar implements of the same class as being capable of producing the detail observed.</p>
QJR6ZY	<p>The solder wire (Item 3) was identified as having been cut by the diagonal cutter (Item 1). The solder wire (Item2) was eliminated as having been cut by the diagonal cutter (Item 1).</p>
QPD3Q8	<p>The item 1 cutter is functional. The item 2 wire is eliminated as having been cut by the item 1 cutter. The item 3 wire is identified as having been cut by the item 1 cutter. The item T1 box was not examined. The test samples will be returned to the submitting agency.</p>
QYGG9Y	<p>Items – Description/Visual Examination: Item 1: One (1) Pittsburgh brand diagonal cutter with black rubber handles. Item 2: One (1) cut solder wire with blue paint, striated toolmarks observed. Item 3: One (1) cut solder wire with white paint, striated toolmarks observed. Examination Results: Tests toolmarks were created using Item 1 for comparison purposes. Microscopic Comparison Conclusions: Identification: Based upon the reproducibility of class characteristics and microscopic individual characteristics, the following identifications were made: Lab Item Evidence Type: Conclusion: Item 3 Striated toolmarks Created by Item 1 (diagonal cutter) 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 Evidence Type : Conclusion: Item 2 Striated toolmarks Inconclusive as being created by Item 1 (diagonal cutter)</p>
RAWN7	<p>We would not conclude with a 'yes' or 'no' answer. We use a Bayesian conclusion with a verbal conclusion scale, which is defined by ranges of LR values. For Item 2 we would conclude a LR supporting the proposition that an other diagonal cutter has produced the toolmark instead of the questioned diagonal cutter. The strength of the LR would be in the order of magnitude of 10.000. For Item 3 we would conclude a LR supporting the proposition that the questioned diagonal cutter has produced the toolmark instead of another diagonal cutter. The strength of the LR would be in the order of magnitude higher than 1.000.000.</p>

TABLE 2

WebCode	Conclusions
RGWXY	Comparison microscope examinations were conducted between the suspect toolmarks and standards made with the submitted diagonal cutter. The toolmark found on exhibit 3 was made by exhibit 1, the submitted diagonal cutter. The toolmark found on exhibit 2 was not made by exhibit 1 based on differences in class and individual characteristics.
RNCNEX	The wire in Item 2 displays class characteristics similar to those produced by the diagonal cutter in Item 1; however, due to a lack of correspondence in individual characteristics, the solder wire in Item 2 could not be included or excluded as having been created by Item 1. The wire in Item 3 was created by the diagonal cutters in Item 1, based on agreement observed in individual characteristics.
RWT6AT	The diagonal pliers (1-01) were functional. One piece of silver wire (1-03) was identified as having been cut by the diagonal pliers (1-01) due to consistent and repeatable pattern areas of marks. One piece of silver wire (1-02) was not identified or eliminated as having been cut by the diagonal pliers (1-01) due to agreement in available class characteristics but a lack of consistent and repeatable pattern areas of marks.
T8HK8T	Cutter recovered from the suspect's vehicle (item 1) left traces on cut piece of solder wire (marked with white paint) (item 3)
THAU63	1. Examination of Exhibit 1 revealed one pair of Pittsburgh brand diagonal cutters designed to be used as an opposed jaw, center cut pinching tool. a. Exhibit 1 measures 109.51mm long. b. Test standards, sub-exhibited as Exhibit 1.1, were created using Exhibit 1. 2. Examination of Exhibit 2 revealed one nonferromagnetic solder wire displaying damage consistent with that caused by an opposed jaw, center cut pinching tool such as diagonal cutters. a. Exhibit 2 measures 20.95mm long and 2.89mm in diameter. b. Microscopic comparison revealed the damage on Exhibit 2 was not caused by Exhibit 1 due to sufficient disagreement of individual characteristics. 3. Examination of Exhibit 3 revealed one nonferromagnetic solder wire displaying damage consistent with that caused by an opposed jaw, center cut pinching tool. a. Exhibit 3 measures 24.79mm long and 2.90mm in diameter. b. Microscopic comparison revealed the damage on Exhibit 3 was caused by Exhibit 1 due to sufficient agreement of individual characteristics. Please note all measurements are approximate.
TQUAH6	Pieces of wire is presented for forensic examination, which are conventionally numbered as No.2 (marked in blue) and No.3 (marked in white), as well as a diagonal cutter. Two wire fragments (sections) of similar material and colour are presented for the experimental sample. The following question is asked to be decided by the experts: whether the cuts on the wires No.2 and No.3 are developed or not by the presented diagonal cutter. Initially, a visual and microscopic examination of the damage on the investigated wires (No.2 – marked in blue and No.3 – marked in white) and the surface of the diagonal cutter was performed, at which time it was determined that the damaged surfaces of both wires have dynamic traces – parallel lines – in the form of tracks, which are similar to the working edges of the presented diagonal cutter. To answer the question whether the traces on the wires have developed or not by the presented diagonal cutter, we made experimental cuts on the undamaged wire at different angles, with different forces and directions. The traces obtained during the experiment and the traces on the test wire No.2 (blue) and No.3 (white) were compared using a microscope LEICA DFC 495, at which stage there was a match with the traces on the wire No.3 (white) in both, general and individual signs. Specifically: in the form, in the mutual arrangement of the traces and in the microrelief, which gives us the basis for the conclusion that the trace on the mentioned wire No.3 (white) is caused by the presented diagonal cutter, while the trace on the wire No.2 (blue) is not developed by it.
TWNZCV	The Pittsburgh diagonal cutter (Item 1) can reproduce identifiable toolmarks. The Pittsburgh diagonal cutter (Item 1) did not produce the cuts and toolmarks in Item 2. The Pittsburgh diagonal cutter (Item 1) produced the cuts and toolmarks in Item 3.
UD9DYM	Examinations showed the tool marks on Item 2 were not created by Item 1. Examinations showed the tool marks on Item 3 were created by Item 1.
UPKKW9	1. Examinations showed Item 2 was not cut by Item 1 due to differences in the cutting edge engagement and insufficient corresponding individual marks. 2. Examinations showed Item 3 was cut by Item 1.

TABLE 2

WebCode	Conclusions
URPB23	Item #1 tests were compared microscopically with cuts on the ends of Item #2 and #3. There is agreement in all discernible class characteristics. Item #2 There is disagreement in individual characteristics sufficient for elimination. Item #2 was not cut by Item #1. Item #3 There is agreement in corresponding individual characteristics sufficient for identification. Item #3 was cut by Item #1.
UUEGLY	The Item 1 tool was examined and determined to be a Pittsburgh brand diagonal cutter. Toolmarks present on Item 2 were microscopically examined and eliminated as having been produced by the Item 1 tool based on sufficient differences in individual characteristics. Toolmarks present on Item 3 were microscopically examined and identified as having been produced by the Item 1 tool based on corresponding class and individual characteristics.
UZJFV4	Item 2 cut piece of soldier wire (marked with blue paint) was not cut with the Item 1 diagonal cutter recovered from the suspect's vehicle. Item 3 cut piece of soldier wire (marked with white paint) was cut with the Item 1 diagonal cutter recovered from the suspect's vehicle.
V7PARK	Examinations showed that the tool marks present on Item 2 were not produced by the Item 1 diagonal cutter tool. Examinations showed that the tool marks present on Item 3 were produced by the Item 1 diagonal cutter tool.
VCWVJN	Tool Mark Analysis: Methodology: Physical (Visual Examination). Microscopy (Comparison Microscope). Test marks were made with Item 1, the diagonal cutter, using submitted testing media. Item 1A, the test marks, was sealed in a manila envelope and will be returned with the evidence to the submitting agency. The tool mark on Item 3, the cut wire, was made with Item 1, the diagonal cutter, based upon corresponding class and individual microscopic characteristics. The tool mark on Item 2, the cut wire, was not made with Item 1, the diagonal cutter, based upon different class and individual microscopic characteristics.
WECM7A	[No Conclusions Reported.]
WLFLK7	Item 3 was microscopically compared with test specimens produced by the Item 1 tool, revealing correspondence of class characteristics and individual distinguishing characteristics. It was concluded that Item 3 was made by the Item 1 tool blades. Item 2 was microscopically compared with test specimens produced by Item 1, finding class characteristic correspondence. The individual characteristics were insufficient for meaningful comparison. It was concluded that Item 2 could not be identified to nor excluded from having been produced by the Item 1 tool.
WWEAPW	[No Conclusions Reported.]
XAH3J7	The cut ends of Items 2 and 3 were microscopically compared to test cuts taken from the Item 1 diagonal cutter, and it was determined that Item 3 was cut by Item 1. Item 2 was not cut by Item 1 due to significant differences in individual characteristics.
XBQ3YK	1) The diagonal side-cutters (Exhibit 1) cut the piece of solder wire marked in white (Exhibit 3). 2) Test cuts from the diagonal side-cutters (Exhibit 1) were compared to the piece of solder wire marked in blue (Exhibit 2) and were inconclusive. While there was agreement of discernable class characteristics and few individual characteristics, there was not enough disagreement to make an exclusion. The generated test cuts (Exhibit 1.1) were retained with the Exhibit 1 tool.
XHBDU2	The Exhibit 1 diagonal cutters were used to make test toolmarks. The test toolmarks were designated Exhibit 1.1. Toolmarks present on the cut end of the Exhibit 2 wire bear class characteristics consistent with having been produced by a pinching or shearing tool such as diagonal cutters or tin snips. The Exhibit 2 toolmarks could not be identified or excluded as having been made by the Exhibit 1 diagonal cutters. The result of the comparison was inconclusive. (Inconclusive). The Exhibit 3 toolmarks were identified as having been made by the Exhibit 1 diagonal cutters. (Source identification).
XJ2MYV	A comparison of the tool marks on the cut pieces of solder wire in items 2 and 3 with test marks made using the suspected diagonal cutter, item 1 was undertaken. A high degree of correspondence was noted between the tool marks on item 3 and the test marks. There was no correspondence with the tool marks on item 2 and the test marks. I have considered the proposition that the tool marks on the cut piece of solder wire in item 3 were made using the suspected diagonal cutter; the results of this

TABLE 2

WebCode	Conclusions
	examination provide conclusive support for this proposition. The tool marks on the cut piece of solder in item 2 have been made by a different tool.
XQMEBV	Observed toolmarks on item 2 have not been produced by item 1. Observed toolmarks on item 3 have been produced by item 1.
XVGAD3	Based on the reproducibility of class and individual characteristics, the questioned toolmarks present on Item 3 were microscopically identified as having been made by the diagonal cutter of Item 1.
Y3R2TQ	AFTER COMPARISON UNDER THE MICROSCOPE FOR ITEM 2 (BLUE PAINT), IT WAS FOUND THAT THE CLASS CHARACTERISTICS DID NOT MATCHED WITH THE CONTROLS MADE IN THE LAB USING THE PROVIDED TOOL. SO ITEM 2 WAS EXCLUDED. AFTER COMPARISON UNDER THE MICROSCOPE FOR ITEM 3 (WHITE PAINT), IT WAS FOUND THAT THE CLASS CHARACTERISTICS MATCHED WITH THE CONTROLS MADE IN THE LAB USING THE PROVIDED TOOL. SO IT WAS FURTHER COMPARED UNDER MICROSCOPE FOR INDIVIDUAL CHARACTERISTICS AND AFTER POSITIVE RESULT IT WAS FOUND THAT THE ITEM 3(WHITE PAINT) WAS CUT BY THE PROVIDED TOOL.
YFM2UV	1. Examination of Exhibit 1.1 revealed one opposed jaw pinching type cutting tool (Pittsburgh 4-1/2 in. diagonal cutters, 63814, 40695). Exhibit 1.1 was used to create Exhibit 1.1.1 (test standards). Exhibit 1.1.1 will be retained with Exhibit 1.1. 2. Examination of Exhibits 1.2 and 1.3 revealed each to contain one silver colored wire approximately 0.115 inches in diameter consistent with solder. Exhibit 1.2 is approximately 0.907 inches long with a blue mark on one end. Exhibit 1.3 is approximately 1.541 inches long with a white mark on one end. a. Exhibit 1.2 and 1.3 each contain damage on one end consistent with being cut by a pinching type cutting tool such as diagonal cutters or similar tools and are suitable for comparison. b. Marked ends not examined. 3. Exhibits 1.1.1, 1.2, and 1.3 were microscopically compared. a. Toolmarks observed on Exhibit 1.2 were not made by the Exhibit 1.1 tool due to agreement of class characteristics and sufficient disagreement of individual characteristics observed. b. Toolmarks observed on Exhibit 1.3 were made by the Exhibit 1.1 tool due to agreement of class characteristics and sufficient agreement of individual characteristics observed.
YRAFPH	Microscopic comparison revealed the Exhibit 3 wire was cut (see footnote 1) by the Exhibit 1 pliers. Microscopic comparison of the Exhibit 2 wire to the Exhibit 1 pliers was inconclusive. The class characteristics of test cuts made using the Exhibit 1 pliers were similar to the Exhibit 2 cut wire. Some limited agreement of individual characteristics was observed however it was insufficient for identification. Additionally, disagreement was found in the comparison of these same individual characteristics, but it was insufficient for an exclusion. Footnote 1: Identification: Agreement of all discernible class characteristics and sufficient agreement of a combination of individual 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.
Z8F4AW	Item 1 is a "PITTSBURGH" brand diagonal cutter, which uses a pinching action. The Item 2 solder wire was excluded as having been cut by the Item 1 diagonal cutters. Toolmarks present on the Item 3 solder wire were identified as having been produced by the Item 1 diagonal cutters.
ZCWG3W	1. Exhibit 1 is a ferromagnetic opposed jaw pinching center cut Pittsburgh brand diagonal cutter. Test standards, labeled 1.1, were generated from this tool for comparison purposes and are now included with the packaging of Exhibit 1. 2. Exhibits 2 and 3 are each one piece of non-ferromagnetic cut solder wire with toolmarks suitable for microscopic comparison. a. Exhibit 2 is 23.81 mm long and 2.95 mm in diameter. b. Exhibit 3 is 33.41 mm long and 2.95 mm in diameter. 3. Microscopic examination of Exhibits 1.1, 2, and 3 revealed: a. Exhibit 3 toolmarks were caused by the Exhibit 1 tool due to sufficient agreement of individual characteristics. b. Exhibit 2 toolmarks were not caused by the Exhibit 1 tool due to sufficient disagreement of individual characteristics. The Exhibit 2 toolmarks are consistent with an opposed jaw pinching type tool such as diagonal cutters and any of these tools found throughout the course of investigation should be submitted to the laboratory along with Exhibit 2 for comparison. All measurements are approximate.
ZQECC2	Visual and microscopic analyses of the evidence items containing the questioned toolmarks Q1 (Item

TABLE 2

WebCode	Conclusions
	<p>2) and Q2 (Item 3) and the reference standards created from the diagonal cutter K1 (Item 1) were performed and the results of the examinations and comparisons are as follows: The toolmarks present on Q2 (Item 3) were identified as having been produced by the K1 (Item 1) diagonal cutter based on agreement of all discernible class characteristics and sufficient agreement of individual characteristics. The toolmarks present on Q1 (Item 2) were excluded as having been produced by the K1 (Item 1) diagonal cutter based on disagreement of individual characteristics.</p>
ZZK4V4	<p>Item 1 is a pair of Pittsburgh brand diagonal cutters, which uses a pinching action. Items 2 and 3 are pieces of cut solder wire with toolmarks consistent with having been produced by a pinching action. Toolmarks present on the Item 3 cut solder wire were identified as having been produced by the Item 1 diagonal cutters. Due to a difference in class characteristics, the Item 2 cut solder wire was excluded as having been cut by the Item 1 diagonal cutters.</p>

Additional Comments

TABLE 3

WebCode	Additional Comments
2G68WP	Toolmarks present on the Item A1-2 wire exhibit the same discernable class characteristics as those produced with the item A1-1 diagonal cutter; however, because of the lack of sufficient suitable corresponding microscopic markings, it was not possible to identify or eliminate the item A1-1 as having produced the toolmarks on the item A1-2 wire.
2VLACT	<p>Methods: Tool: The type, action, and manufacturer of a tool are normally determined by directly observing the function and manufacturer markings on the tool in question. When these are not present, published materials and tool literature in the Firearms/Toolmarks Discipline reference library may be used to make determinations. When a microscopic comparison is necessary using a questioned tool, test samples are created using a test material that is softer or similar in quality to the item being compared. 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 examined and compared. If the class characteristics of the toolmarks are not clearly different, the examination moves to a second stage using comparative microscopy. Comparative examinations of the impressed and striated toolmarks, in at least two items, are conducted 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: 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: Tool: The results of tool examinations describe type and/or operating condition of the tool as it was received in the Firearms/Toolmarks Discipline. 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 variations in substrate, changes in tool working surfaces from wear, corrosion, subclass, damage, or the employment of unusual tool/work piece orientations, toolmark reproduction may be incomplete or insufficient, as a result 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>
6924KN	Please see wording in # 2 [Table 2: Conclusions].
6P47XL	Item 2 was inconclusive due to lack of agreement of individual characteristics (striated toolmarks).
6WLELJ	I use LIMS generated item numbers. Those numbers are as follows: Item 01-01: Agency Item 1. Item 01-02: Agency Item 2. Item 01-03: Agency Item 3.

TABLE 3

WebCode	Additional Comments
73NMMJ	Identifications of toolmarks with a specific tool are made to the practical, not absolute, exclusion of all other tools. This is because it is not possible to examine all tools in the world, a prerequisite for absolute certainty. The conclusion that sufficient agreement for identification exists between two toolmarks means that the likelihood another tool could have made the questioned mark is so remote as to be considered a practical impossibility.
7BXGEQ	A pattern examination of toolmarks present on the Item 2 wire and Item 1 diagonal cutter was inconclusive due to insufficient quality and/or quantity of corresponding individual characteristics.
98C6XZ	Item #2 is eliminated as being cut by the submitted diagonal cutters based on the differences seen in individual characteristics. See photos for comparisons.
A27V4D	Similarity in class characteristics were observed between test cuts from the Item 01-01 diagonal cutter and Item 01-02 small segment of solder wire, but lack of agreement or disagreement of individual characteristics ultimately led to an inconclusive determination.
AAFGUT	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.
B62YGH	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.
B7T6MA	Identification: Based on the agreement of the individual characteristics observed through microscopic comparison examination. Elimination: Based on the disagreement of the subclass and individual characteristics observed through microscopic comparison examination.
BLQCNH	The toolmarks on item 1-2-1 solder wire could not be identified or eliminated as having been made by item 1-1 diagonal cutters. The inconclusive conclusion was based on an absence of agreement or disagreement for a conclusion of identification or elimination, respectively.
BUKAHC	insufficient disagreement of class and individual characteristics
DJPZX8	Used sheet lead test standards for comparisons.
F8R7BN	Methods: Tool: The type, action, and manufacturer of a tool are normally determined by directly observing the function and manufacturer markings on the tool in question. When these are not present, published materials and tool literature in the Firearms/Toolmarks Discipline reference library may be used to make determinations. When a microscopic comparison is necessary using a questioned tool, test samples are created using a test material that is softer or similar in quality to the item being compared. 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 examined and compared. If the class characteristics of the toolmarks are not clearly different, the examination moves to a second stage using comparative microscopy. Comparative examinations of the impressed and striated toolmarks, in at least two items, are conducted 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

TABLE 3

WebCode	Additional Comments
	<p>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: 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: Tool: The results of tool examinations describe type and/or operating condition of the tool as it was received in the Firearms/Toolmarks Discipline. 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 variations in substrate, changes in tool working surfaces from wear, corrosion, subclass, damage, or the employment of unusual tool/work piece orientations, toolmark reproduction may be incomplete or insufficient, as a result 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>
G2XGG3	<p>The cut in the wire (Item 2) was of a similar class to that created by the bottom sides of the cutting tool (Item 1). Test to test comparison showed good agreement in the striae pattern however no correspondence could be found when comparing the test marks to the striae pattern in the cuts in the wire (item 2). The cutting tool (Item 1) was therefore eliminated as having made the cut to the wire (Item 2).</p>
G7W7D	<p>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.</p>
G87KPP	<p>Item 2 was not eliminated from the tool due to consistent class characteristics and the lack of established reproducibility of individual characteristics. Our lab does not routinely eliminate based on individual characteristics without the lack of reproducibility.</p>
HRMJ4J	<p>Because the toolmark on item 2 appears as having been made with the same type of tool as item 1, there are some similar details, and therefore we cannot exclude 100 % from making the cut.</p>
L2KFHW	<p>Possible lack of reproducibility or damage.</p>
L64DCE	<p>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>
NTHVLE	<p>Methods: Tool: The type, action, and manufacturer of a tool are normally determined by directly observing the function and manufacturer markings on the tool in question. When these are not present, published materials and tool literature in the Firearms/Toolmarks Discipline reference library may be</p>

TABLE 3

WebCode	Additional Comments
	<p>used to make determinations. When a microscopic comparison is necessary using a questioned tool, test samples are created using a test material that is softer or similar in quality to the item being compared. 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 examined and compared. If the class characteristics of the toolmarks are not clearly different, the examination moves to a second stage using comparative microscopy. Comparative examinations of the impressed and striated toolmarks, in at least two items, are conducted 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: 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: Tool: The results of tool examinations describe type and/or operating condition of the tool as it was received in the Firearms/Toolmarks Discipline. 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 variations in substrate, changes in tool working surfaces from wear, corrosion, subclass, damage, or the employment of unusual tool/work piece orientations, toolmark reproduction may be incomplete or insufficient, as a result 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>
PHGX4X	For the inconclusive comparison between the test toolmarks from Exhibit 1 and the Exhibit 2 wire, the discernible class characteristics match and there are some matching individual characteristics, which removes an elimination, but there is insufficient agreement of matching individual characteristics for an identification.
Q9TA6N	The tool supplied is of low industrial quality. The solder supplied appears to be lead free and is hard. The combination of the two could cause the striae to significantly change upon each cut.
QPD3Q8	I was originally given the wrong test by CTS. The original test was submitted then retracted a few times to document the error. Ultimately it was decided to send me the correct test. CTS sent me the correct test and these are my conclusions for the new test.
RAWN7	For item 2 (evidence supports another diagonal cutter than the questioned one) we would also make a remark on the current state of the diagonal cutter. If the current state of the questioned diagonal cutter is different (modified/damaged) from the state during the crime, the testmarks made in the lab are not representable for the crime scene toolmark. In the conclusion we have assumed that the current state of the questioned diagonal cutter is not changed since the crime scene marks are made. There are no observations stating otherwise.

TABLE 3

WebCode	Additional Comments
RNCNEX	Item #2 had similarities to the diagonal cutters in Item 1; however, I was unable to match individual marks.
RWT6AT	Due to the observed combination of characteristics there was enough similarity of class characteristics and individual characteristics to prevent an elimination. Some minor differences in the directions of marks were observed but this could have been through the cutting process.
THAU63	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.
UPKKW9	Item 1 is a diagonal cutting pliers with a single pivot point which is an integral rivet. Item 1 uses a center cut action created by grinding the beveled edges of the jaws to a steeper cutting edge. The apex of the cutting edges do not accurately align at the point of closure nor is there any play in the action, creating an overbite in the cut marks. The cut on Item 2 is also a center cut design. The cut mark created on Item 2 is a much cleaner cut where both apexes of the cutting edges of the unknown pliers accurately align causing a nice clean cut. The cut on Item 3 had sufficient corresponding individual marks and also displayed the overbite characteristics created by the misaligned center cut edges of Item 1.
WFLK7	An inconclusive was rendered on 2 because: The class characteristics of the tool are not completely represented in these marks. While I see some potentially significant differences in what I believe to be impressions from the striae in the bevel of the blades, I haven't seen or heard any discussed of this phenomena and am not entirely certain how much variation can be expected in different marks from the same tool. I'm not entirely certain I haven't missed a trick in attempting to replicate the marks.
XQB3YK	SEE ABOVE [Table 2: Conclusions].
XHBDU2	The Exhibit 2 wire bears the same class characteristics as those produced by the Exhibit 1 tool. Due to neither sufficient agreement nor disagreement of individual characteristics, the result of the comparison was inconclusive.
XVGAD3	Based on the agreement of all discernable class characteristics however, due to a lack of corresponding individual characteristics the questioned toolmarks present on Item 2 could not be microscopically identified or eliminated as having been made by the diagonal cutter of Item 1.
Y3R2TQ	NOTE : THE CUTTING PLACE WAS ALMOST FROM THE MIDDLE OF TOOL
YFM2UV	TECHNICAL NOTES: Class characteristics are defined as measurable features of a firearm/tool which indicate a restricted source 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.
ZQECC2	The statement that 'sufficient agreement' exists between two toolmarks means that the agreement of individual characteristics is of a quantity and quality that the likelihood another tool could have made the mark is so remote as to be considered an impossibility. Sufficient agreement is related to the significant duplication of random toolmarks as evidenced by a pattern or combination of patterns of surface contours.
ZZK4V4	Methods: Pattern Examination: Toolmarks, whether they are present on evidence items or secondary

TABLE 3

WebCode	Additional Comments
	<p>evidence created in the Laboratory, undergo two stages of comparison. First, the class characteristics are examined and compared. If the class characteristics of the toolmarks are not clearly different, the examination moves to a second stage using comparative microscopy. Comparative examinations of the impressed and striated toolmarks, in at least two items, are conducted 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 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. Tool The type, action, and manufacturer of a tool are normally determined by directly observing the function and manufacturer markings on the tool in question. When these are not present, published materials and tool literature in the Firearms/Toolmarks Discipline reference library may be used to make determinations. When a microscopic comparison is necessary using a questioned tool, test samples are created using a test material that is softer or similar in quality to the item being compared. 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 variations in substrate, changes in tool working surfaces from wear, corrosion, subclass, damage, or the employment of unusual tool/work piece orientations, toolmark reproduction may be incomplete or insufficient, as a result 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. Tool: The results of tool examinations describe type and/or operating condition of the tool as it was received in the Firearms/Toolmarks Discipline.</p>

-End of Report-
(Appendix may follow)

Test No. 23-5281: Toolmarks Examination

DATA MUST BE SUBMITTED BY **June 12, 2023, 11:59 p.m. EDT** TO BE INCLUDED IN THE REPORT

Participant Code: U1234A

WebCode: UHPWJV

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 a theft that occurred at an electrical company. Multiple spools of solder wire were believed to be cut and large sections taken. Investigators received a tip and apprehended one of the employees later that day. A diagonal cutter was recovered from the suspect's vehicle. Investigators have removed the cut end of each spool of solder wire and are requesting that you examine the wire sections and determine if any were cut using the suspect's diagonal cutter.

Please note the following:

- Each Item is in an envelope, it is suggested that when the items are removed from their labeled envelope, they be marked according to your laboratory procedure.

Items Submitted (Sample Pack T1):

Item 1: Diagonal cutter recovered from the suspect's vehicle.

Item 2: First cut piece of solder wire (marked with blue paint).

Item 3: Second cut piece of solder wire (marked with white paint).

1.) Did the suspect's diagonal cutter (Item 1) produce the questioned toolmarks on either of the submitted cut pieces of solder wire (Items 2 or 3)?

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