



Shooting Reconstruction - Angle Determination

Test No. 20-5620 Summary Report

Each sample set contained a wooden box that consisted of one entrance hole, one exit hole and a "TOP" label to distinguish the orientation of the box. In addition, one "A" label and one "1" label was placed on opposing sides of the box to assist participants when reporting the entrance/exit holes and direction of travel. Participants were requested to determine the character associated with the entrance hole, the direction of travel and calculate the angles. Data were returned from 106 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: Entrance Hole</u>	<u>4</u>
<u>Table 2: Direction of Travel</u>	<u>7</u>
<u>Table 3: Angles</u>	<u>13</u>
<u>Table 4: Conclusions</u>	<u>21</u>
<u>Table 5: Additional Comments</u>	<u>32</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 a wooden box that consisted of one entrance hole, one exit hole and a "TOP" label to distinguish the orientation of the box. In addition, one "A" label and one "1" label were placed on opposite sides of the box to assist participants when reporting the entrance/exit holes and direction of travel. Participants were requested to determine the entrance hole, the direction of travel and calculate the angles. The front of the box containing the "A" label was associated with the entrance hole and the direction of travel was right to left, downward. The angles as measured during production are described below.

PRODUCTION: The sample was placed onto a fixed angle set up (jig). A 9mm CZ Evo Scorpion firearm was affixed above the jig and a digital angle finder was placed on the jig to confirm the angle to be shot.

The Horizontal (Azimuth) angle was measured at 4° from perpendicular, 86° right to left or 94° left to right. The Vertical angle was measured downward at 29° or 61° and 151° upward.

SAMPLE SET ASSEMBLY: After each sample was shot, it was securely placed in a sample pack box. This process was repeated until all of the desired samples were produced.

VERIFICATION: All three predistribution laboratories reported Horizontal and Vertical angles within +/-5° from the expected responses.

Summary Comments

This test was designed to allow participants to assess their proficiency in shooting reconstruction, with a focus on angle determination. Each sample set consisted of a wooden box (Item 1) containing an entrance and exit hole. The wooden box was designated with a "TOP" label to assist participants with the orientation of the sample. In addition, one "A" label and one "1" label were placed on opposite sides of the box to assist participants when reporting the entrance/exit holes and direction of travel. [Refer to Manufacturer's Information for preparation details.]

ENTRANCE HOLE: All 106 responding participants identified the side labeled "A" as being the area containing the entrance hole.

DIRECTIONALITY: Of the 106 responding participants, 104 reported a right to left direction and two participants reported a left to right direction. In regards to upward/downward directionality, 105 participants reported a downward direction and one reported an upward direction.

ANGLE DETERMINATION:

HORIZONTAL

Any reported horizontal angles that fell outside ranges 0° - 9° (from perpendicular), 81° - 91° (right to left) and 89° - 99° (left to right) were highlighted as inconsistent. These ranges were determined by using a factor of $\pm 5^{\circ}$ from the expected response and taking the participant's reported uncertainty into consideration.

Of the 100 participants that reported horizontal angles, 70 (70%) reported angles ranging from 81° to 91° (right to left), 18 (18%) reported angles ranging from 0° to 9° (perpendicular) and six (6%) reported angles ranging from 89° to 99° (left to right). Six participants reported angles that did not fall within $\pm 5^{\circ}$ from the expected response.

VERTICAL

Any reported vertical angles that fell outside ranges 146° - 156° (upward) and 24° - 34° or 56° - 66° (downward) were highlighted as inconsistent. These ranges were determined by using a factor of $\pm 5^{\circ}$ from the expected response and taking the participant's reported uncertainty into consideration.

Of the 100 participants that reported vertical angles, 92 (92%) reported angles ranging from 24° to 34° or 56° to 66° (downward). Eight participants reported angles that did not fall within $\pm 5^{\circ}$ from the expected response.

Six participants did not report any angles. CTS is aware that some labs will report directionality only and will not report any angle measurements.

Currently, reported angles are reviewed using the uncertainty factor of $\pm 5^{\circ}$ as well as the participant's reported uncertainty. CTS is actively researching and validating our review process of these reported angle measurements. It should be noted that in future iterations of this test, CTS may use En Analysis as part of the review process.

Entrance Hole

Which label on the box represents the entrance hole?

TABLE 1

WebCode	Character	WebCode	Character
26EJ3K	A	9JDTRD	A
284N2J	A	9K6R7B	A
2CXHYK	A	B24J6H	A
2JYY7J	A	B4UPL9	A
2LN46H	A	BAJ3PH	A
2RPJBH	A	BF48DC	A
3CW6RH	A	C8M7B8	A
3MYA2J	A	CBNA6F	A
48HP2Q	A	CDEGK7	A
4QRQQH	A	CYT2H7	A
62LGVM	A	D7W8WA	A
64CNCD	A	DE7WA8	A
6K2QWN	A	DGU9AD	A
6LRWDE	A	DKRUWA	A
6M6LFQ	A	DXGLN6	A
6ZDCFD	A	E8J7NC	A
73BDTF	A	FZDU3Z	A
78742C	A	G26884	A
7HR99C	A	GAZ6YD	A
7KWWQM	A	GGKAM8	A
7ML37D	A	GYF386	A
8BLU6L	A	H8PRL4	A
8P7A9L	A	HJJ4Z3	A
8RWFNC	A	HRD9T4	A
9CE7ZD	A		

WebCode	Character	WebCode	Character
HVDJP4	A	R6PUAZ	A
HX2VN9	A	RLDCYU	A
JEMYJ3	A	RR4L9T	A
JXYNWZ	A	RRPZYQ	A
K37EZ7	A	RURX9Y	A
K4J8BZ	A	RWYF7U	A
K8FRH6	A	TDJLVY	A
KMDYF8	A	TLRZUU	A
KN46VX	A	TM6P3Y	A
KZH3Z2	A	U2YJ6R	A
L6RFHZ	A	VMYWHV	A
LWGDWY	A	VWPQP	A
LX9CBX	A	W6C33Q	A
MAXQR6	A	WJCWFK	A
NABLPX	A	X4BPUN	A
NBP7G8	A	X6QLMN	A
NDEDXX	A	X8ZMRV	A
NQ2KY6	A	XJTD9T	A
NVULYY	A	XXA9NP	A
PE63EW	A	XZFQMK	A
PMY4XV	A	Y8A2QN	A
PXGRRU	A	YCNTKN	A
QMV2P3	A	YPFHKU	A
QTGVLZ	A	YR33LR	A
QZY6AW	A	YTACHV	A
R4JCC6	A	YVZHYL	A
R6AHRV	A	Z4ACML	A

WebCode	Character	WebCode	Character
ZDEJ2L	A		
ZKEUGR	A		
ZVUT3M	A		

Response Summary			Participants: 106
Which label on the box represents the entrance hole?			
Character:	A		1
Total:	106		0
Percent:	100.0%		0.0%

Direction of Travel

What is the direction of travel of the bullet through the box? (check all that applies)

TABLE 2

WebCode	Left / Right	Upward / Downward
26EJ3K	Right to Left	Downward
284N2J	Right to Left	Downward
2CXHYK	Right to Left	Downward
2JYY7J	Right to Left	Downward
2LN46H	Right to Left	Downward
2RPJBH	Left to Right	Downward
3CW6RH	Right to Left	Downward
3MYA2J	Right to Left	Downward
48HP2Q	Right to Left	Downward
4QRQQH	Right to Left	Downward
62LGVM	Right to Left	Downward
64CNCD	Right to Left	Downward
6K2QWN	Right to Left	Downward
6LRWDE	Right to Left	Downward
6M6LFQ	Right to Left	Downward
6ZDCFD	Right to Left	Downward
73BDTF	Right to Left	Downward
78742C	Right to Left	Downward
7HR99C	Right to Left	Downward

TABLE 2

WebCode	Left / Right	Upward / Downward
7KWWQM	Right to Left	Downward
7ML37D	Right to Left	Downward
8BLU6L	Right to Left	Downward
8P7A9L	Right to Left	Downward
8RWFNC	Right to Left	Upward
9CE7ZD	Right to Left	Downward
9JDTRD	Right to Left	Downward
9K6R7B	Right to Left	Downward
B24J6H	Right to Left	Downward
B4UPL9	Right to Left	Downward
BAJ3PH	Right to Left	Downward
BF48DC	Right to Left	Downward
C8M7B8	Right to Left	Downward
CBNA6F	Left to Right	Downward
CDEGK7	Right to Left	Downward
CYT2H7	Right to Left	Downward
D7W8WA	Right to Left	Downward
DE7WA8	Right to Left	Downward
DGU9AD	Right to Left	Downward
DKRUWA	Right to Left	Downward

TABLE 2

WebCode	Left / Right	Upward / Downward
DXGLN6	Right to Left	Downward
E8J7NC	Right to Left	Downward
FZDU3Z	Right to Left	Downward
G26884	Right to Left	Downward
GAZ6YD	Right to Left	Downward
GGKAM8	Right to Left	Downward
GYF386	Right to Left	Downward
H8PRL4	Right to Left	Downward
HJJ4Z3	Right to Left	Downward
HRD9T4	Right to Left	Downward
HVDJP4	Right to Left	Downward
HX2VN9	Right to Left	Downward
JEMYJ3	Right to Left	Downward
JXYNWZ	Right to Left	Downward
K37EZ7	Right to Left	Downward
K4J8BZ	Right to Left	Downward
K8FRH6	Right to Left	Downward
KMDYF8	Right to Left	Downward
KN46VX	Right to Left	Downward
KZH3Z2	Right to Left	Downward

TABLE 2

WebCode	Left / Right	Upward / Downward
L6RFHZ	Right to Left	Downward
LWGDWY	Right to Left	Downward
LX9CBX	Right to Left	Downward
MAXQR6	Right to Left	Downward
NABLPX	Right to Left	Downward
NBP7G8	Right to Left	Downward
NDEDXX	Right to Left	Downward
NQ2KY6	Right to Left	Downward
NVULYY	Right to Left	Downward
PE63EW	Right to Left	Downward
PMY4XV	Right to Left	Downward
PXGRRU	Right to Left	Downward
QMV2P3	Right to Left	Downward
QTGVLZ	Right to Left	Downward
QZY6AW	Right to Left	Downward
R4JCC6	Right to Left	Downward
R6AHRV	Right to Left	Downward
R6PUAZ	Right to Left	Downward
RLDCYU	Right to Left	Downward
RR4L9T	Right to Left	Downward

TABLE 2

WebCode	Left / Right	Upward / Downward
RRPZYQ	Right to Left	Downward
RURX9Y	Right to Left	Downward
RWYF7U	Right to Left	Downward
TDJLVY	Right to Left	Downward
TLRZUU	Right to Left	Downward
TM6P3Y	Right to Left	Downward
U2YJ6R	Right to Left	Downward
VMYWHV	Right to Left	Downward
VWVWQP	Right to Left	Downward
W6C33Q	Right to Left	Downward
WJCVFK	Right to Left	Downward
X4BPUN	Right to Left	Downward
X6QLMN	Right to Left	Downward
X8ZMRV	Right to Left	Downward
XJTD9T	Right to Left	Downward
XXA9NP	Right to Left	Downward
XZFQMK	Right to Left	Downward
Y8A2QN	Right to Left	Downward
YCNTKN	Right to Left	Downward
YPFHKU	Right to Left	Downward

TABLE 2

WebCode	Left / Right	Upward / Downward
YR33LR	Right to Left	Downward
YTACHV	Right to Left	Downward
YVZHYL	Right to Left	Downward
Z4ACML	Right to Left	Downward
ZDEJ2L	Right to Left	Downward
ZKEUGR	Right to Left	Downward
ZVUT3M	Right to Left	Downward

Response Summary				Participants: 106		
What is the direction of travel of the bullet through the box?						
<i>Direction:</i>	Right to Left	Left to Right	No Response	Upward	Downward	No Response
Total:	104	2	0	1	105	0
Percent:	98.1%	1.9%	0%	0.9%	99.1%	0%

Angles

TABLE 3 - Horizontal (Azimuth)

WebCode	Angle Measurement	Uncertainty (in degrees)
26EJ3K	87	5
284N2J	85	5
2CXHYK	2	
2JYY7J	2° from perpendicular	7
2LN46H	86	
2RPJBH	86	2
3CW6RH	86.0 (4.0 NATO)	3
3MYA2J	5	
48HP2Q	87	3
4QRQQH	77	3
62LGVM	87	5
64CNCD	87	undetermined
6K2QWN	2.5 (92.5-90= 2.5 FROM LEFT TO RIGHT)	5
6LRWDE	86.1	Undetrmined
6M6LFQ	88	5
6ZDCFD	85	Undetermined
73BDTF		
78742C	84	undetermined
7HR99C	86 (right to left)	5
7KWWQM	83	5
7ML37D	84	5
8BLU6L	86	5
8P7A9L	85	5
8RWFNC	88	5
9CE7ZD		
9JDTRD	88.1	1
9K6R7B	93	5.0

TABLE 3 - Horizontal (Azimuth)

WebCode	Angle Measurement	Uncertainty (in degrees)
B24J6H	85	5
B4UPL9	86 (O to right)	n/a
BAJ3PH	85°	5°
BF48DC	85	4
C8M7B8	96	5
CBNA6F	91	.2
CDEGK7	87	5
CYT2H7	4	5
D7W8WA		
DE7WA8	3.5	2.5
DGU9AD	5 from orthogonal	5
DKRUWA	96	5
DXGLN6	1	5
E8J7NC	85	5.0
FZDU3Z	03	5
G26884	89	5
GAZ6YD	84	5
GGKAM8	85	2
GYF386	87	5
H8PRL4	85	N/A
HJJ4Z3	84	5
HRD9T4	88	
HVDJP4	88	5
HX2VN9	4	NA
JEMYJ3	5	5
JXYNWZ	96	5
K37EZ7	85	
K4J8BZ	3	7
K8FRH6	86.5 R to L	5

TABLE 3 - Horizontal (Azimuth)

WebCode	Angle Measurement	Uncertainty (in degrees)
KMDYF8	87	.3
KN46VX	86	5
KZH3Z2	4	5
L6RFHZ	86	5
LWGDWY	30	5
LX9CBX	86	Undetermined
MAXQR6	85	5
NABLPX	86	5
NBP7G8	32.1	.8
NDEDXX		
NQ2KY6	87	5
NVULYY	94	5
PE63EW	33 (Horizontal 33 degrees)	2
PMY4XV	86	n/a
PXGRRU	3	5
QMV2P3	87	5
QTGVLZ	86.0	
QZY6AW	86	4
R4JCC6	85	5
R6AHRV		
R6PUAZ	85°	5°
RLDCYU	86	N/A
RR4L9T	87	5
RRPZYQ	87	5
RURX9Y	86	5
RWYF7U		
TDJLVY	2	
TLRZUU	85	
TM6P3Y	86 degrees right to left	

TABLE 3 - Horizontal (Azimuth)

WebCode	Angle Measurement	Uncertainty (in degrees)
U2YJ6R	85	
VMYWHV	87	5
VWWPQP	87.0 (Right to left)	N/A
W6C33Q	85	NA
WJCWFK	86.268	undetermined
X4BPUN	5	2.5
X6QLMN	3 (perpendicular)	7
X8ZMRV	33	5
XJTD9T	87	2
XXA9NP	5	5
XZFQMK	86	Undetermined
Y8A2QN	93	5
YCNTKN	85.0	
YPFHKU	86	3
YR33LR	85	5
YTACHV	86	5
YVZHYL	86	5
Z4ACML	80	5
ZDEJ2L	85	5
ZKEUGR	57	5
ZVUT3M	86	5

TABLE 3 - Vertical

WebCode	Angle Measurement	Uncertainty (in degrees)
26EJ3K	58	5
284N2J	34	5
2CXHYK	33	
2JYY7J	34° from perpendicular	7
2LN46H	58	
2RPJBH	56	1
3CW6RH	-33.0	3
3MYA2J	30	
48HP2Q	33	3
4QRQQH	55	2
62LGVM	31	5
64CNCD	33	undetermined
6K2QWN	32.2	5
6LRWDE	31.1	Undetermined
6M6LFQ	58	5
6ZDCFD	35	Undetermined
73BDTF		
78742C	33	undetermined
7HR99C	-32.5	5
7KWWQM	32	5
7ML37D	-32.7	5
8BLU6L	33	5
8P7A9L	35	5
8RWFNC	58	5
9CE7ZD		
9JDTRD	122.7	2
9K6R7B	-33	5.0
B24J6H	31	5
B4UPL9	60 (O on top)	n/a

TABLE 3 - Vertical

WebCode	Angle Measurement	Uncertainty (in degrees)
BAJ3PH	32°	5°
BF48DC	47	4
C8M7B8	-32	5
CBNA6F	60	.2
CDEGK7	-32	5
CYT2H7	33	5
D7W8WA		
DE7WA8	31.5	2.5
DGU9AD	33 downward	5
DKRUWA	-30	5
DXGLN6	33	5
E8J7NC	32	5.0
FZDU3Z	32	5
G26884	-33	5
GAZ6YD	32	5
GGKAM8	30	2
GYF386	32	5
H8PRL4	30	N/A
HJJ4Z3	34	5
HRD9T4	30	
HVDJP4	33	5
HX2VN9	34	NA
JEMYJ3	30	5
JXYNWZ	-32	5
K37EZ7	32	
K4J8BZ	31	7
K8FRH6	-33.5	5
KMDYF8	32	.3
KN46VX	32	5

TABLE 3 - Vertical

WebCode	Angle Measurement	Uncertainty (in degrees)
KZH3Z2	33	5
L6RFHZ	32	5
LWGDWY	5	5
LX9CBX	31	Undetermined
MAXQR6	32	5
NABLPX	33	5
NBP7G8	4.4	.3
NDEDXX		
NQ2KY6	33	5
NVULYY	58	5
PE63EW	3 (Right to left 3 degrees)	2
PMY4XV	31.2	n/a
PXGRRU	33	5
QMV2P3	30	5
QTGVLZ	32.2	
QZY6AW	33	4
R4JCC6	30	5
R6AHRV		
R6PUAZ	33°	5°
RLDCYU	32.3	N/A
RR4L9T	56	5
RRPZYQ	-32	5
RURX9Y	-31	5
RWYF7U		
TDJLVY	32	
TLRZUU	32	
TM6P3Y	31.5 degrees	
U2YJ6R	31	
VMYWHV	-32	5

TABLE 3 - Vertical

WebCode	Angle Measurement	Uncertainty (in degrees)
VWVQP	32.4 (Downward)	N/A
W6C33Q	30	NA
WJCWFK	31.473	undetermined
X4BPUN	33	2.5
X6QLMN	34 (perpendicular)	7
X8ZMRV	86	5
XJD9T	33	2
XXA9NP	30	5
XZFQMK	31	Undetermined
Y8A2QN	33	5
YCNTKN	32.8	
YPFHKU	32	3
YR33LR	-32	5
YTACHV	60	5
YVZHLY	-33	5
Z4ACML	55	5
ZDEJ2L	58	5
ZKEUGR	86	5
ZVUT3M	33	5

Conclusions

TABLE 4

WebCode	Conclusions
26EJ3K	One (1) projectile impact causing a defect was documented entering and penetrating side "A" of Test Block No 20-5620. A corresponding defect was documented exiting (penetrating) side "1" of Test Block No 20-5620. The projectile entered Test Block No 20-5620 from right to left at a downward angle. All measurements were collected utilizing a retractable metal tape measure, a zero-edge protractor, a bubble level, and angle indicator, a plumb bob and a caliper. All measurements were recorded with a margin of uncertainty of +/- 5 degrees of azimuth and elevation. If the substrate the defect is located in is on level ground, and the shooter is on the same level ground, and is not firing the firearm above his/her head, the approximate distance from the shooter's position and the defect can be determined. If there is an elevation difference between the shooter's position and the defect, that distance will need to be factored into the equation.
284N2J	The bullet entrance hole on the wall was the strike marked A. The bullet struck the wall at about a 34 degree downward angle at a slight right to left angle of 85 degree with a +/-5 degree of uncertainty.
2CXHYK	Defect side A entrance (3/8 inch diameter) located 1 1/2 inches below the top edge of the wooden box and 2 5/8 inches left of the right edge of the wooden box. A wipe-off rim was observed visually. Powder grains were observed visually. The presence of a wipe-off rim and powder grains indicates an entrance defect. Defect side 1 exit (1/2 inch diameter) located 3 1/2 inches below the top edge of the wooden box and 2 3/4 inches left of the right edge of the wooden box. The bullet traveled through the wooden box, entering side A and exiting side 1. The direction of travel of the bullet was 2 degrees right to left and 33 degrees downward.
2JYY7J	The firearm that fired the bullet that caused Defect "A" and Defect "A1" entered side "A" moving at a downward angle of approximately 34° from perpendicular and moving from right to left at approximately 2° from perpendicular. The fired bullet perforated the wall entering wall "A" and exiting side "1".
2LN46H	Examination of defects in the box indicated the passage of a bullet. The shot originated somewhere on Side A of the box. The bullet traveled in a downward angle and slightly from right to left and perforated Side A then traveled through the box and perforated Side 1.
2RPJBH	The bullet that caused the holes identified as OEA and OS1 generated a trajectory from the outside to the inside, from left to right, front to back and top to bottom of the wall section.
3CW6RH	The entrance hole is situated on side A, the exit hole on side 1. The slightly oval entrance hole has dimensions between 9.5 - 10.5 mm and has a sharp distinct edge. On the right side of the hole a bullet wipe is visible. The Exit hole is slightly larger (10.5 - 11.5 mm) and shows no distinct edges. The angle measured is 86.0° or 4.0° NATO (+- 3°) Right to left as one faces the wall (side A). The vertical component of the trajectory is determined to be -33.0° (+-3) (downwards).
3MYA2J	The bullet traveled through the partition wall from side A to side 1 at a downward angle of approximately 30 degrees from the horizontal and at a right to left angle of approximately 5 degrees from the perpendicular of the wall surface.
48HP2Q	There was a entry bullet hole (marked A) and an exit bullet hole (marked 1) in Item 1. The vertical component of the trajectory was 33 degree downwards (+/- 3 degrees) and the horizontal component was 87 degrees (+/- 3 degrees) fired from right to left. Directions are described from the viewpoint of the shooter.
4QRQQH	A entrance bullet hole was found. The direction of travel of the bullet is from right to left, and downward (Side "A" to Side "1"). The impact angle from right to left (Horizontal) is 77-80 degrees and downward angle is 55-57 degrees.
62LGVM	TRAJECTORY 1: Corresponds to a shot that enters through the entrance hole OE1 on the face of the box labeled "A", exiting through the exit hole OS1 on the side labeled "1". Its direction is from front to back (face labeled "A" to face labeled "1"), from top to bottom (downward) and slightly from right to left.

TABLE 4

WebCode	Conclusions
64CNCD	A perforating entrance bullet defect was in the wooden box, on the side labeled "A". The trajectory associated with the bullet defect was Side A to Side 1, downward, and slightly right to left.
6K2QWN	After examining the box, entrance hole would be label (A) while measuring the size of the hole its seems to be 9mm round. Calculating the horizontal (Azimuth) angle was measured at 2.5 degree from perpendicular, 87.5 degree from right to left or 92.5 degree from left to right. vertical angle was measured downward at 32.2 degree or 57.8 degree and 122.2 degree upwards. all the angle uncertainty (in degree) +/-5 degree.
6LRWDE	The bullet entered the item on the side labeled "A" and exited the side labeled "1". The bullet path was slightly from right to left and downward.
6M6LFQ	BULLET DEFECT DOCUMENTATION: CSI noted the following observations: Bullet defect "A" – apparent entrance defect. Bullet wipe present on the top right of the defect. Generally circular margins with generalize uniformity. Wood debris positioned inward into the block. Bullet defect "1" – apparent exit defect. Larger defect than "A" with irregular margins. Greater surface damages to the wood. Wood debris protruding out of the block. BULLET TRAJECTORY AND ANGLE DETERMINATION: CSI noted the following observations: The trajectory (or direction of travel) of the bullet through the block was observed to be downward and slightly right to left. The horizontal angle was observed to be approximately 88° (±5°). The vertical angle was observed to be approximately 58° (±5°).
6ZDCFD	The bullet perforated the box approximately 40mm below the top edge and approximately 70mm to the left of the right edge. The bullet's path was downward and from right to left. The bullet traveled from "A" to "1" as one views the box.
73BDTF	Pathway A (including impacts A, A1) is consistent with a bullet traveling from surface "A" to surface "1", right to left, and in a downward direction.
78742C	There was a perforating bullet defect to Side A of the wall, with a corresponding exit defect to Side 1 of the wall. The direction of travel of the bullet that created these defects was from Side A to Side 1, downward, and slightly right to left.
7HR99C	A bullet appeared to have perforated the wall, entering on the side labeled "A" and exiting the side labeled "1". The path of the bullet's travel was determined to be slightly right to left at 86° from the vertical plane and at a 32.5° downward angle. These measurements reflect a ±5° measurement of uncertainty with a confidence interval of 95%.
7KWWQM	Projectile entered through side A and exited through side 1. The trajectory for the projectile was 83° right to left and 32° descending.
7ML37D	A perforating bullet hole was observed in a wooden box. The bullet hole entered side A and exited side 1. The bullet hole on side A contained a lead-in mark with bullet wipe on the top edge of the hole. The hole was circular and orthogonal. The bullet hole on side 1 was irregular and the material was pushed outward. The trajectory was right to left and downward. Identifier; Horizontal Angle; Vertical Angle; A; 84°; -32.7°. *All reported angles of incidence include a ±5° uncertainty of measurement. *Negative (-) vertical angles are associated with shots downward, towards the ground. Positive vertical angles are associated with shots upward, towards the sky.
8BLU6L	The perforating impact was determined to have travelled from the side marked "A" through the side marked "1." The direction of travel is 86 degrees to the vertical plane (from right to left) and 33 degrees downward to the horizontal plane. All measurements are approximate.
8P7A9L	In my opinion the bullet was travelling downwards and from right to left. The bullet entered the partition wall at A and exited at 1.
8RWFNC	Shot has been shoot to wall A from right to left in 88 (+-5) degree angle and from up to down in 58 (+-5) degree angle

TABLE 4

WebCode	Conclusions
9CE7ZD	OBSERVATION(s): Impact A - Perforating impact, located on side A (front face) of the piece of wall. Impact A1 - Perforating impact, located on side 1 (rear face) of the piece of wall. CONCLUSION(s): Pathway A (including impacts A, A1) is consistent with a bullet traveling from front to back, right to left, and in a downward direction.
9JDTRD	The entrance hole was located on side "A" and the exit hole on side "1" with general direction : right to left downward.
9K6R7B	Defect A is consistent with an entrance defect. This bullet perforated the box at defect A (primary defect) and perforated the box at defect 1 (secondary defect). The bullet path has a horizontal angle of 93 degrees and a vertical angle of -33 degrees. Note: Positive vertical angles represent an upward trajectory while negative angles represent a downward trajectory.
B24J6H	Impact entry A entered the wall traveling at approximately 85° (+/-5°) from right to left, downward at approximately 31° angle (+/-5°).
B4UPL9	The bullet traveled in a downward direction and slightly from right to left, perforating the A side of the wood. The bullet then perforated and exited out the number 1 side of the wood.
BAJ3PH	The wall from a warehouse were fired from "A" to "1", from right to left and downward; with a horizontal angle 85° +- 5° and a vertical angle 32° +-5.
BF48DC	A entrance bullet hole was found. The bullet travelled from side "A" through side "1" by impact angle of 85 degree (right to left) and 47 degree upward.
C8M7B8	This bullet perforated the box from defect A (primary impact) through defect 1. The bullet path has a horizontal angle of 96 degrees and a vertical angle of -32 degrees.
CBNA6F	By inspecting the wood and evaluating the physical characteristics of the hole, it was determined that it was consistent with the passage of a fired bullet. 1. The letter A is a borehole in a left to right downward trajectory, passing through and exiting at number 1.
CDEGK7	The bullet that created the two defects traveled from face "A" to face "1" with a downward (-32 degrees) and approximately perpendicular (87 degrees right-to-left) trajectory. Note: The uncertainty for all angle measurements is +/- 5 degrees.
CYT2H7	An entrance hole, Hole A, was located on the upper half of the Item 1 wall section on side A, with a corresponding exit hole, Hole 1, on the lower half on side 1. A trajectory rod was placed through holes A and 1 for trajectory measurements. The bullet path entered Hole A in the upper half of Side A on the Item 1 wall section and exited through Hole 1 on the lower half of Side 1, traveling from Side A of the wall section towards Side 1, from the right side of the wall section (as looking at Side A) towards the left side, and downward. This trajectory path has a horizontal measurement of 4 degrees (+/- 5 degrees) right of perpendicular to Side A of the wall section and a vertical measurement of 33 degrees (+/-5 degrees) downward. No fired bullets were recovered from or associated with this bullet path through Item 1.
D7W8WA	Pathway AA (including impacts AA, AA1) is consistent with a bullet traveling from side 'A' to side '1', right to left and in a downward direction.
DE7WA8	[No Conclusions Reported.]
DGU9AD	bullet entered side A with a downward vertical angle of 33 degrees +-5 degrees. Bullet traveled right to left with an angle 5 degrees from orthogonal +-5 degrees (85 degrees from surface plane of wall, exited side 1.

TABLE 4

WebCode	Conclusions
DKRUWA	The square block of wood appeared to have two defects observed on opposite sides. Measurements were taken of the block of wood along with approximate size of the defects observed in the wood. One bullet hole was labeled A and photographed with and without a scale. The other bullet hole was labeled A1 and was photographed with and without a scale. Side A was determined to be the entrance bullet hole (A) and Side 1 was determined to be the exit hole (A1). After placing a rod into the bullet holes the trajectory appeared to have a downward slope going from right to left. Measurements, including angles, are contained within the notes and can be used for further reconstruction purposes. Notes can be presented upon request.
DXGLN6	Item 1 - a section of a partition wall which contains one entrance hole and one exit hole. The submitted section of wall partition (Item 1) exhibited two perforating defects, consistent with those that would be produced by a fired bullet. The defect on side "A" was consistent with an entrance hole, and that on side "1" was consistent with an exit hole. The fired bullet producing these defects would have passed through the partition wall (Item 1) from side "A" to side "1" at a downward angle of approximately 33 degrees and from right to left at an angle of approximately 1 degree.
E8J7NC	Side A appears to contain an entrance hole based on the deformation of the wood and apparent bullet wipe around the hole. Side 1 appears to contain an exit hole based on the deformation of the wood and lack of any apparent bullet wipe. Chemical tests were not performed as they were not needed for the determination of entrance and exit holes. A trajectory rod was placed through both bullet holes and the probe and string method was used to estimate the bullet trajectory measurements. The vertical angle measured 32 degrees in a downward trajectory. The horizontal angle measured 85 degrees from right to left as you are facing side A (the entrance hole). I printed the photographs that were taken to estimate the same measurements and used the photographs to independently measure both angles. The vertical angle measured 32 degrees in a downward trajectory. The horizontal angle measured 86 degrees from right to left as you are facing side A (the entrance hole). The reported angles will be as follows: 1) Side A contains the entrance hole. 2) The bullet was traveling in a downward trajectory, traveling from right to left. 3) The horizontal (azimuth) angle is approximately 85 degrees. The vertical angle is approximately 32 degrees.
FZDU3Z	The small size and sharp edges/boundary of the hole on the side pre-labelled as 'A' on the evidence item (said to be portion of partition wall) suggests it to be the 'entrance hole'. The relatively large size hole and protruding, irregular edges/boundary of the hole on the side pre-labelled as '1' on the evidence item suggests it to be the 'exit hole'. The measured horizontal (azimuth) angle is found as 3 degrees right to left from shooter's perspective with an uncertainty ± 5 degrees. The measured vertical angle is found as 32 degrees, coming from upwards to downwards with an uncertainty of ± 5 degrees.
G26884	The wall had markings indicating the original orientation of the wall during the incident. Two holes were observed in the wood. The section of wall was constructed in such a way that it created an enclosed area in which additional exits or entrances would have been observable. The side of the wall marked as "A" contained an entrance bullet hole. The side marked "1" had a corresponding exit hole. The way the wall is constructed allows these two holes to be related and an angle determination to be done. As facing the entrance hole the trajectory was 89 degrees (+/- 5 degrees), right to left, with 90 degrees being straight, and with a downward angle of 33 degrees (+/- 5 degrees), with 90 degrees being level.
GAZ6YD	There is a perforating circular hole located on side "A" of the small wooden box with bullet wipe present and smooth edges with an exit on side "1" with rough edges. The hole measures $\sim 9\text{mm} \times 7\text{mm}$. The vertical angle measures ~ 32 degrees downward with an azimuth angle of ~ 84 degrees from right to left.
GGKAM8	The bullet hole on Side A was noted with bullet wipe and was photographed. The bullet hole on Side A was then processed with sodium rhodizonate and tested positive for the presence of lead residue. Bullet #1 entered the wooden box at Side A at approximately 85 degrees - Right to Left, and Approximately 30 degrees - downward, exiting on Side 1. (+/- 2 degrees).
GYF386	The perforating bullet defect observed on the wood box entered the box at defect A and exited at defect 1. The direction of travel associated with the trajectory is from right to left and downward.

TABLE 4

WebCode	Conclusions
H8PRL4	The bullet struck the wall on side A, traveling downward at approximately 30 degrees from horizontal and slightly right to left, at an approximately 85 degree angle from the wall surface. The bullet exited the wall on side 1.
HJJ4Z3	The bullet entrance hole on the wall was the strike marked A. The bullet struck the wall at about ~34 degree downward angle and a slight right to left angle of ~84 degree with a +/- 5 degree of uncertainty.
HRD9T4	The direction of travel of the bullet through the section of the wall was a slight right to left with a downward angle
HVDJP4	The bullet entered side "A" of the box moving slightly right to left, and downward at 33 degrees. The bullet then exited side "1" of the box.
HX2VN9	Note: The inclination angle is reported relative to level ground. The azimuth angle is defined with 0 degrees as perpendicular to the surface struck. There was a defect on the section of a partition wall from a warehouse. The projectile associated with this defect perforated the wall from side A to side 1, at a downward angle of 34 degrees and an angle of 4 degrees from the right to the left.
JEMYJ3	The trajectory of the projectile was in a downward angle at approximately 30 degrees and approximately 5 degrees from right to left (+/- 5 degrees).
JXYNWZ	Defect A: Wooden box - This bullet initially perforated the wooden box at defect A (primary impact) and traveled downward perforating the wooden box at defect 1 (secondary impact). The bullet path had a vertical angle of -32 degrees and a horizontal angle of 96 degrees.
K37EZ7	I examined the submitted section of partition wall and concluded that the hole in surface "A" is the entrance hole. After placing a trajectory rod through the entrance hole and the exit hole, I measured the horizontal (azimuth) angle as approximately 85° traveling from right to left and the vertical angle as approximately 32° degrees traveling downward.
K4J8BZ	The bullet defect in side "A" is circular in shape and the wooden material is pushed in. The bullet defect in Side "1" is irregular in shape and the material appears to be broken outward. The bullet that caused this defect entered side "A" traveling from right to left at a horizontal angle of three (3) degrees from perpendicular and a downward vertical angle of thirty-one (31) degrees from perpendicular exiting side "1".
K8FRH6	Based on the examination of the location and features of the two perforations through the plywood wall section I concluded that the trajectory of the projectile was consistent with the projectile entering the wall on the side marked 'Test No. 20-5620 A' and exiting on the side marked 'Test No. 20-5620 1' which showed bevelling of the exit side. A trajectory rod was passed through the holes in the wall section and measurements taken using a protractor. Measurements of the trajectory showed the projectile entering the box at an angle of approximately 86.5 degrees (3.5 degrees from orthogonal), from right to left. Based on these measurements I also found that the vertical angle was in a downward direction of approximately -33.5 degrees from orthogonal (56.5 degrees from wall).
KMDYF8	After having observed and analyzed the piece of evidence submitted, and evaluation of the physical characteristics of the perforation identified as A, it was determined that it is consistent with the passage of a discharged bullet projectile. Its trajectory is from right to left and downwards, passing what is described by number 1. This perforation has a horizontal angle of 87 and a vertical angle of 32.
KN46VX	EVIDENCE SUBMITTED: Lab Item #; Agency Item #; Description: 1 AD One (1) section of a partition wall containing circular defects in two (2) sides. CONCLUSIONS OF ANALYSIS: The defect in the partition wall is consistent with a bullet hole. The bullet path is from front to back, slightly right to left at 86 degrees and downward at a 32 degree angle.
KZH3Z2	There is an elliptical shaped hole on side "A" with gray coloring around the perimeter and smooth edges, which indicates an entrance hole. There is an irregular shaped hole on side "1" with jagged edges and splinters pushed out, which indicates an exit hole. The vertical angle is approximately 33 degrees downward. The horizontal angle is approximately 4 degrees from right to left.

TABLE 4

WebCode	Conclusions
L6RFHZ	The submitted partition wall was found to have a pair of defects. A single bullet likely perforated the partition wall on surface "A" and exited from surface "1". The trajectory, viewed facing surface "A", was determined to be approximately 86 degree (+/- 5 degree) from right to left, and 32 degree (+/- 5 degree) downwards.
LWGDWY	The trajectory is described regarding 3 reference planes: horizontal plane (parallel to top and bottom faces), longitudinal plane (parallel to 1 and A faces), transversal plane (perpendicular to both others planes). The bullet progressed through the box from face A (entrance hole) to face 1 (exit hole) on an axis oriented from top to the bottom with the angle of 30°, from horizontal plane, and from right to left when following the bullet path with the angle of 5° from the transversal plane.
LX9CBX	Bullet defect A was a perforating bullet defect in the box located on the side labeled 'A'. The defect was approximately 4.3 cm below the top of the box and approximately 6.8 cm from the right edge of the box. The general directionality associated with bullet defect A was from side 'A' to side '1', slightly right to left, and downwards.
MAXQR6	The defect in the wall is consistent with a bullet hole entering "side A" and traveling in a downward direction from right to left.
NABLPX	The bullet path is consistent with a bullet that entered side A of the wall section (Item AD) and exited side 1 with a downward angle of approximately 33 degrees from horizontal and traveling right to left an angle of approximately 86 degrees from the wall surface. The distances and angles reported are used as descriptors and are not meant to be interpreted as quantitative forensic test results. All examinations were conducted using the methods outlined in TP-5: Version 13
NBP7G8	The entrance is consistent with a small caliber projectile and there is bullet wipe in the concave area between 9 o'clock and 3 o'clock. The exit exhibits the typical characteristics of outward splintering. The path of the projectile is downward at 32.1 degrees off a vertical plane with a degree of uncertainty of approximately .8 degrees. The direction is off center in a right to left path with a 4 degree deviation with a degree of uncertainty of approximately .3 degrees. Instrumentation was horizontally and vertically calibrated prior to measurements.
NDEDXX	Pathway V (including impacts V, V1) is consistent with a bullet traveling from side A to side 1, right to left and in a downward direction.
NQ2KY6	The projectile penetrated the piece of wood at an 33 degree downward angle going 87 degrees right to left.
NVULYY	There is a single perforating bullet hole to the surface. The entrance is observed on "side A". The trajectory is right to left and downward as viewed from side A.
PE63EW	Existing damage on the box is caused by a firearm and is directed from damage #A to damage #1. Damage #A is of initial origin and damage #1 is a continuation of the damage #A. Damages are directed from up to downward approximately with 33 degrees angle and from right to left approximately with 3 degrees angle due to 1 bullet impact, which diameter is approximately 6,5 – 7,5 mm.
PMY4XV	Two corresponding bullet holes, labeled as A (A1) & 1 (A2) were on the wall section. The bullet entered the wall section on side A (A1), traveled in a downward direction from right to left, and exited the wall section on side 1 (A2).
PXGRRU	Defect 1- One 1/4"x 1/4" bullet hole on the "A" side. Located 3 7/8" up from the floor and 3 1/4" in from the left wall edge. Consistent with a projectile perforating 3 1/8" plywood wall, traveling downward at an approximate 33 degree angle and right to left at an approximate 3 degree angle. Defect 1a- Projectile exited on the "1" side through the wood, 1/4' x 1/4" hole located 2" up from the floor and 3" in from the left wall edge. Projectile was not recovered.

TABLE 4

WebCode	Conclusions
QMV2P3	Bullet strike A is a circular perforating entrance hole located in a piece of wall approximately 3.25in. from the left edge and approximately 3.75in. from the bottom edge. The projectile that caused A travelled at a 30' (+/-5') downward angle and from the right to the left at an 87' (+/-5') angle from the surface of the wall. Bullet strike 1 is the associated perforating exit hole, irregular in shape, located in the opposite side of the piece of wall approximately 2.5in. from the left edge and approximately 1.75in. from the bottom edge. No angle measurements were collected from bullet strike 1 as it is an exit hole.
QTGVLZ	The Item 1 partition wall was struck by one (1) projectile. The resulting defects were caused by a projectile originating from the front right of the wall, travelling to the left at a downward angle.
QZY6AW	The entrance hole was located in side A at approximately 7,9 cm from de left edge of the block and approximately 9,7 cm from the bottom edge. The shot entered the block at an approximately 86 degree angle (right to left) and descending at an apprximately 33 degree angle and exited Side 1.
R4JCC6	PROJECTILE TRAJECTORY: Trajectory was established by using a probe inserted through two sequential holes made by the same projectile. Once the probe was inserted, I measured the vertical angle (upward or downward) in relation to the horizontal plane, and the azimuth (horizontal angle). The azimuth angle is reported as left to right or right to left, based on the shooter's perspective. A-1 Projectile Trajectory: Projectile entered the surface marked 'A' downward at 30° (±5°) and from right to left at 85° (±5°).
R6AHRV	Pathway J (including impacts J, J1) is consistent with a bullet traveling from Side A to Side 1, right to left, and in a downward direction.
R6PUAZ	The box was shot through the hole in the wall labeled "A" towards the wall labeled "1", with a downward angle of 33° and from right to left of 85°.
RLDCYU	The bullet entered side A (A1) and exited side 1 (A2). It appears that the bullet path traveled at a downward angle right to left when facing the side of the wall marked "A".
RR4L9T	The projectile entered Item 1 on Side A and exited on Side 1. The projectile traveled from right to left at a downward angle.
RRPZYQ	Exhibit 1 was examined for apparent bullet strikes. Based on appearance and context, two (2) holes, one in either side of Exhibit 1 were determined to be the entrance (Side A) and exit (Side 1) of a single perforating bullet strike (labeled Strike 1). The trajectory angle of Strike 1 was measured. The trajectory of Strike 1 was 87 degrees, from right to left with a downward trajectory of -32 degrees from horizontal. footnotes: A perforating strike is one in which the projectile passes completely through the object. All angles are reported with a measurement of uncertainty of +/- 5 degrees.
RURX9Y	I observed two areas of bullet related damage (identified as Item A (entry) and Item 1 (exit)) to the wall. This damage relates to the trajectory of a fired bullet travelling in an approximately northerly direction. The bullet path was determined to be right to left and downwards (when looking at the damage from side A).
RWYF7U	Pathway A (including impacts A, A1) is consistent with a bullet traveling from side "A" to side "1", right to left and in a downward direction.

TABLE 4

WebCode	Conclusions
TDJLVY	<p>This laboratory test report contains the conclusions, opinions and interpretations of the member whose initials/signature appears on the report. Results relate only to the items tested. Unless otherwise noted, all activities performed at [Address]. This is a supplement to the original report. On 08/10/2020, [Name] indicated CID had collected a block of wood with possible bullet defects in relation to a shooting investigation. CID delivered the item to the Forensic Services Section. CID requested trajectory analysis. DESCRIPTION Item #1: One wood square block with two possible bullet defects in a sealed cardboard box. EXAMINATION On 09/23/2020, the item was removed from the packaging. The wood block was observed to have two possible bullet defects, already labeled hole "A" and hole "I." Hole "A" and Hole "I" were on opposite faces of the block. Hole "A" was roughly circular, measuring approximately 7mm long and 9mm wide. Splinters of wood were protruding into the hole. The middle of the defect measured approximately 1.5 inches from the top of the wood block and approximately 3.25 inches from the left side. Hole "I" was slightly square shaped, measuring approximately 10mm long and 13mm wide. Splinters of wood appeared blown out in nature. The middle of the defect measured approximately 3.5 inches from the top of block and approximately 2.75 inches from the left side. Given the observation of Hole "A" with protruding wood splinters and a more circular appearance, a bullet may have entered the block through hole "A" and exited out Hole "I," creating a perforated tunnel. Using a protractor, vertical and horizontal trajectory angles were determined. The bullet appeared to have entered Hole "A" at a downward angle of approximately 32 degrees and right to left at approximately 2 degrees before exiting out Hole "I." The item was sealed back into its original packaging before turning over to the Criminal Evidence Section. TOT: CID. No further to report.</p>
TLRZUU	<p>Item AD has perforating bullet damage with an entrance hole on side A and an exit hole on side 1. The trajectory was approximately 32 degrees downward and approximately 85 degrees relative to the wall surface from right to left. The measurements included in this report are for descriptive purposes only and are not quantitative forensic test results.</p>
TM6P3Y	<p>The following defect was located and documented: A: an apparent perforating entrance hole located on a box approximately 2 3/4" in from the right, and approximately 3 7/8" up from the bottom edge of the side labeled "A". An apparent exit hole "A1" appearing to be related to defect A was located approximately 3" in from the right, and approximately 2" up from the bottom edge of the side labeled "1". The defect perforated the box from right to left at an approximate 86 degree horizontal, and approximate 31.5 degree downward directionality.</p>
U2YJ6R	<p>Item 1 side A has a hole in in the upper third of the box. The hole appears oval shaped and measures approximately 5/16" wide by approximately 3/8" long. There is visible grey residue at the margins of the hole in side A. There are also disc shaped apparent gunpowder particles embedded into the wood partially surrounding the hole in side A. I tested the exterior of the hole in side A with presumptive chemical tests for copper and lead. The area surrounding the hole in side A tested presumptive positive for both copper and lead. The hole in side A is consistent with being an entrance hole. Item 1 side 1 has a hole in the lower third of the box. The area surrounding the hole is damaged and irregularly shaped. The hole, not including the damaged area surrounding it, measures approximately 3/16" wide by approximately 5/16" long. I tested the exterior area surrounding the hole in side 1 with presumptive chemical tests for copper and lead. The area surrounding the hole in side 1 tested negative for lead and presumptive positive for copper at the bottom of the hole. The hole in side 1 is consistent with being an exit hole. The holes present in sides A and 1 are consistent with being made by the passage of a single bullet. The bullet struck the wooden box/warehouse wall on side A and exited through side 1. When the bullet struck side A it was traveling from right to left (as facing side A) and up to down (downward). I measured the horizontal angle to be approximately 85 degrees (from the right side as facing side A) and the downward/vertical angle to be approximately 31 degrees. The reported angle measurements are approximate and are for descriptive purposes only. They are not quantitative forensic test results.</p>

TABLE 4

WebCode	Conclusions
VMYWHV	<p>The section of partition wall measured approximately 6-inches tall by 5-7/8-inches wide by 3-1/4-inches deep. Three adhesive labels were adhering to different surfaces of the partition wall. The labels read as follows: Test No. 20-5620 A, Test No. 20-5620 1, Test No. 20-5620 TOP. An arrow was drawn on one side of the partition wall and pointed toward the side of the box with the label that read in part, "TOP." The side of the box with the label that read "Test No. 20-5620 A" had an approximately circular hole that had gray material (bullet wipe) on the margins and was located near the upper portion of the wall. This hole was determined to be the entrance hole of the projectile. The opposite side of the partition wall had the label that read "Test No. 20-5620 1" had an irregular hole with jagged margins and was located near the middle of the wall. This hole was determined to be the exit hole of the projectile. A probe was placed through these two holes to illustrate the path of this projectile; azimuth and vertical angles were measured. The path of this projectile was determined to be downward and slightly from right to left. TABLE OF MEASUREMENTS: PATH AZIMUTH ANGLE VERTICAL ANGLE A TO 1 87° -32° (down). The azimuth (horizontal plane) angle is measured relative to the face of the partition wall labeled as "A." All measured angles are approximate, +/-5°. [Participant entered data in a format that could not be reproduced in this report.]</p>
VWVWQP	<p>It appears that the bullet entered side A(A1) of the wall and exited through side 1(A2). The bullet path traveled at a downward angle, and slightly from right to left when facing the side of the wall marked A(A1).</p>
W6C33Q	<p>Received for examination was one labeled particle board box, reportedly a portion of a partition wall from a shooting scene. Examination of the orientation of disrupted wood fibers indicated that a bullet entered the face labeled "A" and exited the face labeled "1". I measured the trajectory through the box using a laboratory trajectory tool kit and standard laboratory procedures. The bullet passed through the box moving downward at an approximate 30-degree angle and right to left at an approximate 85-degree angle. The angles reported are used as descriptions and not meant to be interpreted as quantitative forensic test results. All examination was conducted pursuant to Technical Procedure TP-5 (Crime Scene).</p>
WJCWFK	<p>A single perforating bullet defect was in the submitted block of wood reported to be a section of partition wall. A near circular entrance defect was in the side marked "A". This defect was approximately 7.5 cm in from the left side and approximately 4.8 cm down from the top. The wood/wood fibers were pushed inward around the defect. An irregular-shaped exit defect was in the side marked "1". This defect was approximately 7 cm in from the left side and approximately 9.5 cm down from the top. The trajectory path associated with this bullet defect was "A" to "1", downward, and right to left.</p>
X4BPUN	<p>Defect "A" has a downward trajectory of ~33 degrees and an azimuth of ~5 degrees right to left.</p>

TABLE 4

WebCode	Conclusions
X6QLMN	<p>Side "A" contains a single defect which has the appearance of an entry defect, with some of the material around the edges pushed into the defect. This defect has a circular shape with smooth edges. A piece of wood appears to be chipped on the bottom of the defect, creating a circular gap at the bottom of the defect. Defect "A" is a perforating defect with a corresponding exit defect, Defect "A-1", which is located on side 1. Scale tape was placed around the defect and labeled as Defect "A". Additional photo documentation images of Defect "A" with scale were captured. A control test for copper was performed by rubbing a copper jacketed bullet across a new Cuprotesmo test strip with detection reagent, then placing sterile water on the test strip. The control test almost immediately turned a light shade of pink/dark purple showing a positive test for copper. A control test for lead was performed by rubbing a lead bullet across a new Plumbtesmo test strip with detection reagent, and then placing sterile water on the test strip. The control test almost immediately turned a dark purple showing a positive test for lead. A presumptive test for copper was performed on Defect "A". The test was performed by placing sterile water on a separate Cuprotesmo test strip with detection reagent. Wearing a new pair of examination gloves, the test strip is held in place against the bullet defect for approximately 30 seconds; this test had a positive test result. A presumptive test for lead was performed on Defect "A". The test was performed by placing sterile water on a separate Plumbtesmo test strip with detection reagent. Wearing a new pair of examination gloves, the test strip is held in place against the bullet defect for approximately two (2) minutes; this test had a positive test result. The results of the known copper and lead tests and the copper and lead presumptive tests on Defect "A" were photo documented. Interior measurements of Defect "A" were collected with the use of a caliper, with the interior width approximately 5.88 mm and the interior length approximately 6.8 mm. Utilizing a retractable metal tape measure, the location of Defect "A" was obtained. It is approximately 3 3/16 inches from the approximate center of the defect to the left edge of the wall and approximately 3 15/16 inches from the approximate center of the defect to the bottom edge. With the use of a retractable tape measure, the location of Defect "A1" was determined to be approximately 2 7/8 inches from the right edge of the wall and approximately 2 inches from the bottom edge. A yellow trajectory rod was inserted into Defect "A" exiting through Defect "A1". The yellow trajectory rod was held in place by tension in the defect. Photo documentation images of the yellow trajectory rod in place were captured. Utilizing a zero-edge protractor and an angle indicator, the elevation (vertical) and azimuth (horizontal) angles were obtained. The fired bullet entered side "A" moving at a downward angle, with an elevation of approximately 34° from perpendicular and moving from right to left, with an azimuth of approximately 3° from perpendicular.</p>
X8ZMRV	<p>On Friday, August 14, 2020 at approximately 0830 hours, I received a box labeled "CST Forensic Testing Program, Shooting Reconstruction Angle Determination, Test 20-5620, Sample Pack AD" for processing from [Name]. A [Laboratory] Property & Evidence form was completed documenting the chain of custody. The box contained a wooden wall section (CS Item 1) reportedly removed from a warehouse shooting incident. The wall appeared to contain two (2) suspected bullet defects and was labeled with "Top" "Side A" and "Side 1" for orientation. I further labeled the item with "L" and "R" (left/right) for further reference. Processing was documented utilizing digital photos and a rough sketch as well as the use of flight path rods, an inclinometer, and a zero edge protractor. No caliber determination was made. Upon examination, the defect located on Side A appeared to be an entry defect (Labeled "D1") and the defect located on Side 1 appeared to be a corresponding exit defect (Labeled "D2"). This was determined due to the observation of bullet wipe around defect D1 as well as the splinters being pointed inward. Defect D2 was observed to have outward facing splinters and pieces of the wall which were splintered off. The suspected bullet wipe was swabbed utilizing a "Lead Check" swab which indicated positive for the presence of lead. A flight path rod was inserted through both defects and the vertical and horizontal angles obtained. It was determined the flight path of the bullet was approximately 33 degrees downward from the horizontal plane and approximately 86 degrees, right to left along the vertical plane. Once documentation and processing was complete, the evidence was secured in a temporary storage locker to which I maintain the key. The digital photographs were transferred to single digital versatile disc (CS Item 2) and secured in the same locker. On Monday, August 17, 2020 at approximately 1400 hours, I met with [Name] and relinquished custody of CS Items 1 and 2 to her. A [Laboratory] Property & Evidence form was completed documenting the chain of custody. No further action taken, end of report.</p>
XJTD9T	[No Conclusions Reported.]

TABLE 4

WebCode	Conclusions
XXA9NP	The trajectory of the projectile is approximately 30 degrees up to down and approximately 5 degrees right to left.
XZFQMK	One shot was fired into side A and exited side 1 of the partition. The trajectory of this bullet was slightly right to left and downward.
Y8A2QN	Item 1 was a wood box with labels of Top, side A and side 1. Sides A and 1 both had one hole. The hole on side A was oval with a sharp defined edge. The hole on side A was an entrance. The hole on side 1 was irregular with pieces of wood missing. The hole on side 1 was an exit. A trajectory rod was placed through the holes and the bullet path was right to left, at a downward angle. Horizontal angle = 93 ± 5 degrees. Vertical angle = 33 ± 5 degrees.
YCNTKN	The box was struck by one bullet. The bullet entered the box on side A (A1) and traveled in a downward direction, from right to left and exited on side 1 (A2).
YPFHKU	The box has sustained perforating damage with the bullet entering side A and exiting side 1. The track is slightly right to left and downwards.
YR33LR	From the examination the opinion was formed that the projectile has perforated the partition wall, with the entry into the side labelled 'A' and has exited out of the side labelled '1'. When facing the side labelled A the trajectory of the projectile was from right to left and downwards.
YTACHV	86 degrees from right to left. 60 degrees downward. ± 5 degrees uncertainty.
YVZHYL	The submitted portion of the wall has a hole consistent with a bullet impact. The projectile perforates the target from the side labeled A toward the side labeled 1. The trajectory of the projectile would be from A to 1 in a downward direction, slightly right to left when facing side A.
Z4ACML	A entrance bullet hole was found. The direction of travel of the bullet is from right to left, downward, and Side "A" to Side "1". The impact angle from right to left (Horizontal) is 75-85 degrees and downward angle is 50-60 degrees.
ZDEJ2L	Based on visual analysis and results obtained from trajectory analysis, the holes on the submitted box are consistent with bullet holes made from single bullet path. Bullet hole "A" is entrance hole and bullet hole "1" is exit hole. The bullet traveled from right to left and from upward to downward direction. The bullet made a horizontal angle of $85^\circ \pm 5^\circ$ and vertical angle of $58^\circ \pm 5^\circ$.
ZKEUGR	There was a perforating defect into the wall with an entrance on the A side of the wall approximately 3" from the right edge. The trajectory travels very slightly from right to left and in a downward direction. The exit defect is on the rear (side1) approximately 2" up from the bottom of the wall. The vertical angle is approximately 57 degrees and the azimuth (horizontal angle) is approximately 86 degrees. The angles were measured using a trajectory rod. The vertical angle was checked using the Trigonometry method and the result was recorded as 53 degrees. That result was within the ± 5 degrees range.
ZVUT3M	RESULTS: 1. Damage was located on one side (labelled "A") of the wall, Exhibit 1, that is consistent with being an entrance hole caused by a projectile. Damage was located on the opposite side (labelled "1") of the wall, Exhibit 1, that is consistent with being an exit hole caused by a projectile. 2. A projectile path was determined between the entrance and exit holes of the wall, Exhibit 1, having a vertical angle of 33-degrees downward from level and a horizontal angle of 4-degrees from perpendicular, travelling right-to-left. CONCLUSIONS: Projectile impact damage consistent with being caused by one gunshot was located in both sides of the wall, Exhibit 1. The direction of the projectile path is "side A"-to-"side 1", downward and slightly right-to-left.

Additional Comments

TABLE 5

WebCode	Additional Comments
2JYY7J	Side "A" had a single defect approximately 4" from the approximate center of the defect to the floor and 3 3/16" from the approximate center of the defect to the left edge of the wall. This defect, labeled Defect "A", had the characteristics of an entrance defect with a circular shape, smoother edges, material around the edges had been pushed inward towards the interior of the wall, and had the appearance of bullet wipe at the 9 o'clock, 12 o'clock, and 3 o'clock areas of the defect edges. Presumptive tests for copper and lead performed on Defect "A" had both a positive result for both copper and lead utilizing Cuprotesmo and Plumbtesmo test strips and sterile water. Utilizing a caliper, the interior measurements of Defect "A" had a length of approximately 9.19mm and a width of approximately 9.62mm. Side "1" had a single defect approximately 2" from the approximate center of the defect to the floor and approximately 3 1/4" from the approximate center of the defect to the right edge of the wall. This defect, labeled Defect "A1" had the characteristics of an exit defect with an irregular shape, irregular nondescript edges, material around the edges had been pushed outward and away from the defect, and pieces of the wall around the defect were missing. The elevation and azimuth angles were collected by inserting a yellow trajectory rod thru Defect "A" and exiting thru Defect "A1". The trajectory rod was held in place on side "A" utilizing a black snubber washer and on side "A" utilizing a white trajectory cone and a black snubber washer. Utilizing a zero-edge protractor and a bubble level, the elevation and azimuth angles were collected as follows; Elevation - The fired bullet entered wall "A" moving at a downward angle of approximately 34° from perpendicular Azimuth - The fired bullet entered wall "A" moving from right to left at approximately 2° from perpendicular
2RPJBH	If you could give in the future a bit more information about the scene, for example: - if the shooting was inside or outside of the place - the height from the ground to the section of the wall
4QRQQH	Uncertainty values in this proficiency testing depend on individuals.
6K2QWN	The sample was placed on the flat surface, digital angle was used to verify the result.
6LRWDE	The agency is currently undergoing a study on the uncertainty of measurement related to bullet trajectory measurements.
9JDTRD	"uncertainty" is not calculated on a regular basis.
9K6R7B	The horizontal angle was measured from left to right using a zero-edge protractor.
B4UPL9	Our lab does not have an uncertainty of measurement for shooting scene reconstruction.
C8M7B8	Note: Horizontal (azimuth) angles were measured from left to right with respect to the side labeled A. Positive vertical angles represent an upward trajectory while negative angles represent a downward trajectory.
D7W8WA	My unit's policy is to not report angle measurements, thus none were entered into the CTS portal.
DKRUWA	Bullet path has a downward trajectory that goes right to left. (-) means downward travel on the degree measurement.
FZDU3Z	The digital angle finder was set to zero by placing it first, on a flat surface. Evidence was placed at the same flat surface while measuring horizontal and vertical angles. Penetration rod was passed through the holes and anchored in position. The horizontal angle was measured using protractor, plumb line and digital leveller. The vertical angle was measured by digital angle measurer. Direction of travel is specified as Right to Left from shooter's perspective.
H8PRL4	Angle measurements are used for descriptive purposes and are not quantitative forensic test results.
JXYNWZ	Note: Positive vertical angles represent an upward trajectory while negative vertical angles represent a downward trajectory. In addition, horizontal angles were measured from left to right (at defect A).

TABLE 5

WebCode	Additional Comments
K8FRH6	The bullet wipe observed on the top of the entry hole on side 'A' was presumptively tested and found to be lead positive and copper negative. The hole was approximately 8mm in diameter and due to the plywood would be consistent with a projectile of a calibre smaller than 8mm.
KMDYF8	Excellent test to keep developing the knowledge in shooting reconstructions incidents. Thanks!
NBP7G8	The perforation entrance is consistent with a small caliber projectile of approximately .22 to .25 caliber and no visible soot or stippling is present.
PMY4XV	No response provided for horizontal/vertical angles in degrees of uncertainty. Crime Scene does not calculate measurements of uncertainty for angle determination, thus these fields are left blank.
RLDCYU	We don't report angles in our reports per our current SOP, or calculate uncertainty of measurement.
RURX9Y	"northerly direction' mentioned in the above response (4) [Table 4: Conclusions] is an arbitrarily chosen direction as the direction of the path of the bullet is unknown.
TM6P3Y	This laboratory does not conduct or report out degree of uncertainty. Trajectories are only used as descriptors in this laboratory.
U2YJ6R	The reported angle measurements are approximate and are for descriptive purposes only. They are not quantitative forensic test results and we do have an uncertainty budget or a +/- associated with these kinds of measurements.
VWVQP	We do not report angles in our conclusions per our current SOP, nor do we calculate uncertainty of measurement.
WJCWFK	The use of a larger sized caliber bullet was appreciated.
XZFQMK	It was assumed that the defects were caused by a bullet. No chemical testing of these defects was conducted. The uncertainty of measurement could not be determined, therefore, no angle measurements could be reported.
Y8A2QN	Received CTS test PT-0070 labeled as Item 1 in a tape sealed and signed box. Item 1 was a wood box labeling of top, A, and 1 indicating the sides. Item 1 had a hole in sides A and 1. Side "A" hole was smooth at outer surface with the sharp defined oval. Hole in side A was an entrance. A trajectory rod was placed in hole "A" and associated with hole in side "1". Hole in side 1 was irregular with pieces of wood missing around area. Hole in side 1 was an exit hole. Trajectory of bullet was right to left (as you are facing the box of side A) at a downward angle. Protractor number KWM-170303-24. Evi-PAQ angle finder.
YCNTKN	The [Laboratory] Crime Scene Unit does not calculate measurement of uncertainty for angle determination. Therefore they are not reported and the fields are left blank.
YPFHKU	When comparing results from different laboratories, some additional uncertainty could be expected due to test sample differences.
YR33LR	The azimuth (horizontal) angle is measured from the partition wall (shooting reconstruction method).
ZDEJ2L	The reported horizontal and vertical angles are the smaller angles from object surface to trajectory rod.

-End of Report-
(Appendix may follow)

Test No. 20-5620: Shooting Reconstruction - Angle Determination

DATA MUST BE SUBMITTED BY **Oct. 13, 2020, 11:59 p.m.** TO BE INCLUDED IN THE REPORT

Participant Code: U1234A

WebCode: QK8892

Scenario:

Investigators have submitted a section of a partition wall from a warehouse in which a shooting took place. They are asking you to conduct your analysis using your laboratory's procedures.

Please note:

-For this exercise, the sample contains a TOP label for orientation purposes.

-The sample has been labeled with two different characters (A and 1) in which participants can use as reference in reporting.

-Make sure to place the sample on a flat surface when measuring angles.

Items Submitted (Sample Pack AD):

Item 1: A section of the partition wall which contains one entrance hole and one exit hole.

1.) Which label on the box represents the entrance hole?

- A 1

2.) What is the direction of travel of the bullet through the box? (Select one from each column)

- | | |
|-------------------------------------|--------------------------------|
| <input type="radio"/> Left to Right | <input type="radio"/> Upward |
| <input type="radio"/> Right to Left | <input type="radio"/> Downward |

3.) Please record your angles below. (If the angle type below differs from your normal terminology, you may use your preferred terminology in the conclusions section of the data sheet.)

Angle Type (i.e. Azimuth, Vertical, Horizontal)	Angle Measurement (in degrees)		Uncertainty (in degrees)
Horizontal (Azimuth)	<input type="text"/>	±	<input type="text"/>
Vertical	<input type="text"/>	±	<input type="text"/>

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.

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

5.) 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)