



# **Shooting Reconstruction - Angle Determination**

## **Test No. 24-5620 Summary Report**

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Each sample set contained a section of partition wall with one entrance hole and one exit hole. Additionally, each partition was marked with a "TOP" label for orientation, and one "A" label and one "1" label. Participants were asked to determine the entrance hole, the direction of travel, and calculate the angles using their existing protocols. Data were returned from 121 participants and are compiled into the following tables:

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

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

## Manufacturer's Information

Each sample set contained a section of partition wall with one entrance hole and one exit hole. Participants were asked to determine the entrance hole, the direction of travel, and calculate the angles.

SAMPLE PREPARATION: Each box was placed into a fixed angle set-up (jig). The firearm was locked into a gun rest, placed in front of the jig, and a digital angle finder was used to confirm angles. After shooting each box, a "TOP" label was placed 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 with reporting the entrance/exit holes and direction of travel.

VERIFICATION: Predistribution and verification results were consistent with each other and the manufacturer's preparation information. All of the Horizontal and Vertical angles fell within  $\pm 5^\circ$ .

Preparation Values					
Entrance Hole	Exit Hole	Bullet Directionality	Horizontal Angle (Azimuth)	Vertical Angle	Gun Make/Model
1	A	Left to Right, Upward	85°	11°	Glock 42 .380 Auto

## Summary Comments

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This test was designed to allow participants to assess their proficiency in shooting reconstruction, with a focus on angle determination. Participants were supplied with a section of partition wall with one entrance hole and one exit hole. Refer to Manufacturer's Information for preparation details.

ENTRANCE HOLE: All 121 responding participants identified the side labeled as "1".

DIRECTIONALITY: Of the 121 responding participants, 117 (97%) reported both a left-to-right and upward direction of travel. Of the four remaining participants, three participants did not report a direction of travel for either left/right or upward/downward and one participant reported a right-to-left direction of travel.

ANGLE DETERMINATION: Reported angles are reviewed using CTS' uncertainty factor of  $\pm 5^\circ$  from the manufacturer's preparation values.

HORIZONTAL: Any reported horizontal angles that fell outside of the following ranges were marked as inconsistent:  $\pm 5^\circ$  from perpendicular of the prepared value of  $5^\circ$  (0 to  $10^\circ$ ),  $\pm 5^\circ$  from left-to-right of the prepared value of  $85^\circ$  (80 to  $90^\circ$ ), or  $\pm 5$  from right-to-left of the prepared value of  $95^\circ$  (90 to  $100^\circ$ ). Of the 107 responding participants that reported horizontal angles, 102 (95%) reported angles that fell within the ranges described above. Five participants reported angles that fell outside of these ranges.

VERTICAL: Any reported vertical angles that fell outside of the following range were marked as inconsistent:  $\pm 5^\circ$  upward from the prepared value of  $11^\circ$  (6 to  $16^\circ$ ). Of the 107 responding participants that reported vertical angles, 93 (87%) reported angles that fell within the ranges described above. Thirteen participants reported a downward angle and the last participant reported an angle that fell outside of the ranges above.

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

## Entrance Hole

Which label on the box represents the entrance hole?

TABLE 1

WebCode	Character	WebCode	Character
2787PX	1	9DHZJR	1
32Q3DL	1	9RK9N2	1
368PMK	1	A93RVT	1
3BWATL	1	ABB4DU	1
3DHUZH	1	B3TTX9	1
3ETTW7	1	BDEYWX	1
3PDZWU	1	BPA9HK	1
3WBUPM	1	BX3LDE	1
47HRB6	1	BZRPAR	1
47JNLZ	1	CFCZAY	1
4BDL97	1	CRRMLL	1
4W9J9A	1	CV4WAA	1
4ZRGYL	1	CZ396A	1
4ZU4GY	1	DQQC3N	1
67EQNA	1	EJQADG	1
6E3H9G	1	EVZUXA	1
6KDVT2	1	EWBWJ9	1
6L7NNJ	1	F3GPD4	1
6WCL8	1	FG26G4	1
7MVAW2	1	FQ7ENT	1
7W7CH2	1	FRXBCM	1
83QU DP	1	FZU7AL	1
8732ET	1	GB8RWR	1
8FTMH7	1	GNUW33	1
94V2TM	1	GUYVDR	1
9DFC3E	1	GVEXLL	1

<b>WebCode</b>	<b>Character</b>	<b>WebCode</b>	<b>Character</b>
H79VMQ	1	QFPA6K	1
HAUFUF	1	QKK2BW	1
HB6HFE	1	R7E9JK	1
HEKP4E	1	R9LNTB	1
HHJ927	1	RB93GL	1
HKRDGF	1	RFMWY4	1
HMFR7P	1	RJGYX	1
JFC7TF	1	RM73WB	1
JQCZM6	1	T46F6C	1
KZWQM3	1	T89DF6	1
L32E3R	1	TKCWQ6	1
LJ4DPL	1	TMZBFE	1
LPQ4CG	1	TVUDJB	1
LTRAQM	1	U6DAZ3	1
M3BZQK	1	UQTUW3	1
MB69BB	1	UZ4TQE	1
MCKD73	1	VPGEZG	1
MGRYVK	1	VR6NC4	1
MXFAK9	1	W7WET	1
N6TKBE	1	W3LWBG	1
ND7ENV	1	W8FWNQ	1
NDQCJ9	1	W9LGBQ	1
NMU6BN	1	WDFB9R	1
NP68Y8	1	WLD4J8	1
NQAYPZ	1	WMTZC8	1
NTZ2W9	1	WQTB88	1
PQUVU9	1	WYKULF	1
PZGWBH	1	X2LEMK	1
Q72CEF	1	XPDCNH	1

WebCode	Character	WebCode	Character
Y87UT3	1		
Y9ZHBY	1		
YGRZP8	1		
YW9TFY	1		
Z2GEZP	1		
Z6EX4A	1		
Z8KHRA	1		
ZDBR28	1		
ZHJFE9	1		
ZQYYWM	1		
ZR7E6E	1		

<b>Response Summary</b>			Participants: <b>121</b>
Which label on the box represents the entrance hole?			
Character:	A	1	No Response
Total:	0	121	0
Percent:	0.0%	100.0%	0.0%

## Direction of Travel

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

TABLE 2

WebCode	Left / Right	Upward / Downward
2787PX	Left to Right	Upward
32Q3DL	Left to Right	Upward
368PMK	Left to Right	Upward
3BWATL	Left to Right	Upward
3DHUZH	Left to Right	Upward
3ETTW7	Left to Right	Upward
3PDZWU	Left to Right	Upward
3WBUPM	Left to Right	Upward
47HRB6	Left to Right	Upward
47JNLZ	Left to Right	
4BDL97	Left to Right	Upward
4W9J9A	Left to Right	Upward
4ZRGYL	Left to Right	Upward
4ZU4GY	Left to Right	Upward
67EQNA	Left to Right	Upward
6E3H9G	Left to Right	Upward
6KDVT2	Left to Right	Upward
6L7NNJ	Left to Right	Upward
6WCL8	Left to Right	Upward
7MVAW2	Left to Right	Upward
7W7CH2	Left to Right	Upward
83QUDP	Left to Right	Upward
8732ET	Left to Right	Upward
8FTMH7	Left to Right	Upward
94V2TM	Left to Right	Upward

TABLE 2

<b>WebCode</b>	<b>Left / Right</b>	<b>Upward / Downward</b>
9DFC3E	Left to Right	Upward
9DHZJR	Left to Right	Upward
9RK9N2	Left to Right	
A93RVT	Left to Right	Upward
ABB4DU	Left to Right	Upward
B3TTX9	Left to Right	Upward
BDEYWX	Left to Right	Upward
BPA9HK	Left to Right	Upward
BX3LDE	Left to Right	Upward
BZRPAR	Left to Right	Upward
CFCZAY	Left to Right	Upward
CRRMLL	Left to Right	Upward
CV4WAA	Left to Right	Upward
CZ396A	Left to Right	Upward
DQQC3N	Left to Right	Upward
EJQADG	Left to Right	Upward
EVZUXA	Left to Right	Upward
EWBWJ9	Left to Right	Upward
F3GPD4	Left to Right	Upward
FG26G4	Left to Right	Upward
FQ7ENT	Left to Right	Upward
FRXBCM	Left to Right	Upward
FZU7AL	Left to Right	Upward
GB8RWR	Left to Right	Upward
GNUW33	Left to Right	Upward
GUYVDR	Left to Right	Upward
GVEXLL	Left to Right	Upward



TABLE 2

<b>WebCode</b>	<b>Left / Right</b>	<b>Upward / Downward</b>
H79VMQ	Left to Right	Upward
HAUFUF	Left to Right	Upward
HB6HFE	Left to Right	Upward
HEKP4E	Left to Right	Upward
HHJ927	Left to Right	Upward
HKRDGF	Left to Right	Upward
HMFR7P	Left to Right	Upward
JFC7TF	Left to Right	Upward
JQCZM6	Left to Right	Upward
KZWQM3	Left to Right	Upward
L32E3R	Left to Right	Upward
LJ4DPL	Left to Right	Upward
LPQ4CG	Left to Right	Upward
LTRAQM	Left to Right	Upward
M3BZQK	Left to Right	Upward
MB69BB	Left to Right	Upward
MCKD73	Left to Right	Upward
MGRYVK	Left to Right	Upward
MXFAK9		Upward
N6TKBE	Left to Right	Upward
ND7ENV	Left to Right	Upward
NDQCJ9	Left to Right	Upward
NMU6BN	Left to Right	Upward
NP68Y8	Left to Right	Upward
NQAYPZ	Left to Right	Upward
NTZ2W9	Left to Right	Upward
PQUVU9	Left to Right	Upward

TABLE 2

WebCode	Left / Right	Upward / Downward
PZGWBH	Left to Right	Upward
Q72CEF	Left to Right	Upward
QFPA6K	Left to Right	Upward
QKK2BW	Left to Right	Upward
R7E9JK	Left to Right	Upward
R9LNTB	Left to Right	Upward
RB93GL	Left to Right	Upward
RFMWY4	Left to Right	Upward
RJGYX	Left to Right	Upward
RM73WB	Left to Right	Upward
T46F6C	Left to Right	Upward
T89DF6	Left to Right	Upward
TKCWQ6	Left to Right	Upward
TMZBFE	Left to Right	Upward
TVUDJB	Left to Right	Upward
U6DAZ3	Left to Right	Upward
UQTUW3	Left to Right	Upward
UZ4TQE	Left to Right	Upward
VPGEZG	Left to Right	Upward
VR6NC4	Left to Right	Upward
W7WET	Left to Right	Upward
W3LWBG	Left to Right	Upward
W8FWNQ	Left to Right	Upward
W9LGBQ	Left to Right	Upward
WDFB9R	Left to Right	Upward
WLD4J8	Left to Right	Upward
WMTZC8	Left to Right	Upward

TABLE 2

WebCode	Left / Right	Upward / Downward
WQTB88	Left to Right	Upward
WYKULF	Left to Right	Upward
X2LEMK	Left to Right	Upward
XPDCNH	Left to Right	Upward
Y87UT3	Left to Right	Upward
Y9ZHBY	Left to Right	Upward
YGRZP8	Left to Right	Upward
YW9TFY	Right to Left	Upward
Z2GEZP	Left to Right	Upward
Z6EX4A	Left to Right	Upward
Z8KHRA	Left to Right	Upward
ZDBR28	Left to Right	Upward
ZHJFE9	Left to Right	Upward
ZQYYWM	Left to Right	Upward
ZR7E6E	Left to Right	Upward

<b>Response Summary</b>				<b>Participants: 121</b>		
What is the direction of travel of the bullet through the box?						
<i>Direction:</i>	<u>Right to Left</u>	<u>Left to Right</u>	<u>No Response</u>	<u>Upward</u>	<u>Downward</u>	<u>No Response</u>
<b>Total:</b>	1	119	1	119	0	2
<b>Percent:</b>	0.8%	98.3%	0.8%	98.3%	0.0%	1.8%

# Angles

TABLE 3 - Horizontal (Azimuth)

WebCode	Angle Measurement	Uncertainty (in degrees)
2787PX	8 (or 82)	5
32Q3DL	83.7	2.6
368PMK	97	5
3BWATL	83.1	2.6
3DHUZB	82	5
3ETT7	[An angle measurement was not reported by this participant.]	
3PDZWU	84	5
3WBUPM	82	5
47HRB6	[An angle measurement was not reported by this participant.]	
47JNLZ	81	5
4BDL97	80	5
4W9J9A	84	5
4ZRGYL	81.5	
4ZU4GY	82	5
67EQNA	82	5
6E3H9G	82	5
6KDVT2	[An angle measurement was not reported by this participant.]	
6L7NNJ	83	
6WVCL8	97	5
7MVAW2	[An angle measurement was not reported by this participant.]	
7W7CH2	[An angle measurement was not reported by this participant.]	
83QU DP	95	5
8732ET	96	5
8FTMH7	82	5
94V2TM	13	2
9DFC3E	84	
9DHZJR	84	
9RK9N2	83	3
A93RVT	80°	2
ABB4DU	11.40°	0.20°

TABLE 3 - Horizontal (Azimuth)

WebCode	Angle Measurement	Uncertainty (in degrees)
B3TTX9	83	
BDEYWX	[An angle measurement was not reported by this participant.]	
BPA9HK	6.5	5
BX3LDE	81	5
BZRPAR	7 from perpendicular	5
CFCZAY	82	5
CRRMLL	82	5
CV4WAA	82	
CZ396A	82	5
DQQC3N	7	
EJQADG	98.5 from baseline and 8.5 from azimuth	5
EVZUXA	84.3	2.6
EWBWJ9	82	5
F3GPD4	82	5
FG26G4	5	5
FQ7ENT	80	
FRXBCM	11	2
FZU7AL	84	
GB8RWR	[An angle measurement was not reported by this participant.]	
GNUW33	82	5
GUYVDR	81	3
GVEXLL	95	+/- 5
H79VMQ	84	
HAUFUF	84	5
HB6HFE	82	5
HEKP4E	6	2
HHJ927	97	5
HKRDGF	6	5
HMFR7P	83° Left to right	5
JFC7TF	83	5
JQCZM6	81.9	2.6

TABLE 3 - Horizontal (Azimuth)

WebCode	Angle Measurement	Uncertainty (in degrees)
KZWQM3	84	*
L32E3R	82.5	1.5
LJ4DPL	[An angle measurement was not reported by this participant.]	
LPQ4CG	10	3
LTRAQM	83	3
M3BZQK	[An angle measurement was not reported by this participant.]	
MB69BB	81 (from left to right), 9 (from perpendicular), 99 (from right to left)	5
MCKD73	81	5
MGRYVK	13,15	0,4
MXFAK9	97 from baseline and 7 from Azimuth	5
N6TKBE	82	
ND7ENV	88	5
NDQCJ9	82.5	5.0
NMU6BN	7	
NP68Y8	7	5
NQAYPZ	83.4	2.6
NTZ2W9	80	5
PQUVU9	85	0
PZGWBH	81	5
Q72CEF	[An angle measurement was not reported by this participant.]	
QFPA6K	83	5
QKK2BW	81	5
R7E9JK	82	1
R9LNTB	6.1	1.1
RB93GL	7	5
RFMWY4	84	5
RJGYX	83	5
RM73WB	10	
T46F6C	77	2
T89DF6	84	5

TABLE 3 - Horizontal (Azimuth)

WebCode	Angle Measurement	Uncertainty (in degrees)
TKCWQ6	9	
TMZBFE	83 (left to right from baseline)	5
TVUDJB	85	5
U6DAZ3	81	5
UQTUW3	7	5
UZ4TQE	[An angle measurement was not reported by this participant.]	
VPGEZG	83	5
VR6NC4	8	5
VV7WET	82.8	2.6
W3LWBG	83	5
W8FWNQ	7	5
W9LGBQ	81	5
WDFB9R	84	5
WLD4J8	6	
WMTZC8	83	2
WQTB88	7.70	0.39
WYKULF	83	5
X2LEMK	83	5
XPDCNH	82	5
Y87UT3	5	
Y9ZHBY	82	5
YGRZP8	[An angle measurement was not reported by this participant.]	
YW9TFY	97	3
Z2GEZP	[An angle measurement was not reported by this participant.]	
Z6EX4A	84	
Z8KHRA	[An angle measurement was not reported by this participant.]	
ZDBR28	6	5
ZHJFE9	85	5
ZQYYWM	81	5
ZR7E6E	82	2
<b>Count of Reporting Participants 107</b>		

TABLE 3 - Vertical

WebCode	Angle Measurement	Uncertainty (in degrees)
2787PX	10	5
32Q3DL	11.1	2.6
368PMK	12	5
3BWATL	9.5	2.6
3DHUZZ	10	5
3ETTW7	[An angle measurement was not reported by this participant.]	
3PDZWU	77	5
3WBUPM	11.1	5
47HRB6	[An angle measurement was not reported by this participant.]	
47JNLZ	11.8	5
4BDL97	10	5
4W9J9A	12	5
4ZRGYL	100	
4ZU4GY	11	5
67EQNA	11	5
6E3H9G	10	5
6KDVT2	[An angle measurement was not reported by this participant.]	
6L7NNJ	9	
6VVCL8	102	5
7MVAW2	[An angle measurement was not reported by this participant.]	
7W7CH2	[An angle measurement was not reported by this participant.]	
83QUDP	10	5
8732ET	12	5
8FTMH7	10.9	5
94V2TM	84	2
9DFC3E	10	
9DHZJR	13	
9RK9N2	11	3
A93RVT	80°	2
ABB4DU	6.60°	0.30°
B3TTX9	10	
BDEYWX	[An angle measurement was not reported by this participant.]	



TABLE 3 - Vertical

WebCode	Angle Measurement	Uncertainty (in degrees)
BPA9HK	11	3.5
BX3LDE	11	5
BZRPAR	10	5
CFCZAY	10	5
CRRMLL	79	5
CV4WAA	11	
CZ396A	10	5
DQQC3N	10	
EJQADG	12.2	5
EVZUXA	10.1	2.6
EWBWJ9	10	5
F3GPD4	11	5
FG26G4	10	5
FQ7ENT	10	
FRXBCM	7	1
FZU7AL	12	
GB8RWR	[An angle measurement was not reported by this participant.]	
GNUW33	11	5
GUYVDR	11	3
GVEXLL	11.7	
H79VMQ	12.5	
HAUFUF	10	5
HB6HFE	11	5
HEKP4E	10	2
HHJ927	13	5
HKRDGF	12	5
HMFR7P	9 Degrees upward	5
JFC7TF	10	5
JQCZM6	13.6	2.6
KZWQM3	10	*
L32E3R	11.7	1.7
LJ4DPL	[An angle measurement was not reported by this participant.]	

TABLE 3 - Vertical

WebCode	Angle Measurement	Uncertainty (in degrees)
LPQ4CG	10	3
LTRAQM	10.5	3
M3BZQK	[An angle measurement was not reported by this participant.]	
MB69BB	+10	5
MCKD73	12	5
MGRYVK	10	0
MXFAK9	12	5
N6TKBE	11.5	
ND7ENV	11	5
NDQCJ9	10.9	5.0
NMU6BN	11	
NP68Y8	11	5
NQAYPZ	10.9	2.6
NTZ2W9	78	5
PQUVU9	10	0
PZGWBH	78	5
Q72CEF	[An angle measurement was not reported by this participant.]	
QFPA6K	10	5
QKK2BW	11	5
R7E9JK	10	1
R9LNTB	12.1	1.5
RB93GL	10	5
RFMWY4	12	5
RJGYYX	11	5
RM73WB	8	
T46F6C	79	2
T89DF6	78	5
TKCWQ6	11	
TMZBFE	10 (upward)	5
TVUDJB	80	5
U6DAZ3	79	5
UQTUW3	12	5

TABLE 3 - Vertical

WebCode	Angle Measurement	Uncertainty (in degrees)
UZ4TQE	[An angle measurement was not reported by this participant.]	
VPGEZG	12	5
VR6NC4	10	5
W7WET	11.0	2.6
W3LWBG	12	5
W8FWNQ	11	5
W9LGBQ	12	5
WDFB9R	9	5
WLD4J8	11	
WMTZC8	11	1
WQTB88	10.15	0.51
WYKULF	12	5
X2LEMK	+10	5
XPDCNH	14	5
Y87UT3	12	
Y9ZHBY	10	5
YGRZP8	[An angle measurement was not reported by this participant.]	
YW9TFY	101	3
Z2GEZP	[An angle measurement was not reported by this participant.]	
Z6EX4A	12	
Z8KHRA	[An angle measurement was not reported by this participant.]	
ZDBR28	11	5
ZHJFE9	+ 17	5
ZQYYWM	10	5
ZR7E6E	11.5	2
<b>Count of Reporting Participants 107</b>		

# Conclusions

## TABLE 4

WebCode	Conclusions
2787PX	The bullet entered the wall at site '1' and exited at site 'A'. The bullet was traveling slightly upward and slightly left to right.
32Q3DL	A perforating bullet defect was in the wooden box. The bullet entered on side 1 and exited on side A. The directionality of the bullet was upwards and left to right. The azimuth angle measured 83.7° in the left to right direction, and the vertical angle measured 11.1° in the upward direction. Both of these measurements contain uncertainty of $\pm 2.6^\circ$ ( $k=2$ , 95% confidence level).
368PMK	A defect in the board consistent with a bullet impact was located. The trajectory is front to back (1 to A), left to right, and upward.
3BWATL	There was a perforating entrance bullet defect to Side 1, with a corresponding exit defect to Side A. The direction of travel of the bullet was from Side 1 to Side A, at 9.5 degrees upward, and 83.1 degrees left to right. Both of these measurements contain uncertainty of $\pm 2.6$ degrees.
3DHUZB	The item had what appeared to be a perforating bullet defect. The impact points are defined as below: 1 – Entrance defect on the section of the partition wall A – Exit defect on the section of the partition wall The direction of travel of the projectile appeared to be from left to right in an upward angle. The Horizontal Angle of impact was $\approx 82^\circ \pm 5$ . The Vertical Angle of impact was $\approx 10^\circ \pm 5$ .
3ETT7	A section of a wall (Exhibit 1) was submitted to [State] Police Crime Lab personnel for Trajectory Analysis. The agency labeled the top of the wall as well as the defects on both sides. Trajectory Analysis indicated that one shot was fired into the wall from the front. Shot 1: One bullet originated from the front side of the wall ([Company]-1) and exited the back ([Company]-A). This shot is consistent with the shooter being located on the front side of the wall shooting from left to right in an upward direction. No bullets were recovered from this shot.
3PDZWU	After the trajectory Analysis, it can be concluded that the projectile entered through the side identified with the number 1, exiting through the side identified with the letter A, with a trajectory from left to right, upwards.
3WBUPM	Perforated section of partition wall Bullet hole 1 to bullet hole A, slight left to right, slight up.
47HRB6	Investigators have requested Trajectory Analysis on a section of a partition wall in which a shooting took place. Suspected bullet holes were observed on both sides of the partition which have been prelabeled by the agency as "side 1" and "side A." One bullet traveled through side 1 of the partition and exited side A. The trajectory of this shot is slightly left-to-right and upward. No further trajectory analysis was able to be performed on this shot, and no bullet was recovered from this shot.
47JNLZ	The projectile perforated the wooden block, by entering on Side 1 and exiting on Side A. The projectile was traveling upward at 11.7 degrees and from the examiner's left to right at 81 degrees.
4BDL97	The entrance hole was set as 1 and the exit hole as A. The direction of the trajectory was measured to be from left to right and upwards. The horizontal angle was measured as 80° from left to right and the vertical angle was measured as 10° under the horizontal plane.
4W9J9A	x: A perforating entrance hole located on "side 1: of a box approximately 5 1/2cm in from the left and approximately 6 1/2cm down from the top. The hole exhibited wood pushed inward and lead wipe around the inside of the hole. x1: An exit hold on side "A" of the box, located approximately 6 1/2cm from the right and approximately 5 1/2cm down from the top. The hole was splintered and had wood pushed outward. The shot trajectory was measured to be at a 12 degree (upward) incline & 84" left to right. A measurement of uncertainty can be provided upon request.
4ZRGYL	Analysis of the trajectory indicated the bullet originated from an area on side 1, traveled slightly left to right at an upward angle, perforated side 1 and exited side A.
4ZU4GY	The entrance hole is on side "1" and the exit hole is on side "A". The horizontal angle is measured from left to right and is 82 degrees. The vertical angle is upward and is measured to be 11 degrees. If the vertical angle was perpendicular to the wall, it would be 0 degrees
67EQNA	The projectile entered side 1 traveling upward at approximately 11 degrees $\pm$ 5 degrees and left to right at approximately 82 degrees $\pm$ 5 degrees exiting from side A.

TABLE 4

WebCode	Conclusions
6E3H9G	Based on the visual appearance of the defects, the defect associated with the surface labeled "1" appears to be an entrance hole, and the defect associated with the surface labeled "A" appears to be an exit hole. The direction of travel of the bullet through the box was left to right with a horizontal (azimuth) angle of $82^{\circ} \pm 5^{\circ}$ and upward with a vertical angle of $10^{\circ} \pm 5^{\circ}$ .
6KDVT2	Pathway X (including impacts X, X1) is consistent with a bullet traveling from side 1 to side A, left to right, and in an upward direction.
6L7NNJ	A projectile originated on side 1 and traveled through the box exiting side A. The trajectory of the shot was slightly upward and left to right.
6WCL8	A suspected bullet entered the box on Side 1 and exited the box on Side A. The suspected bullet traveled left to right at an upward angle.
7MVAW2	Pathway A (including impacts A, A1) is consistent with a bullet traveling from side 1 to side A, left to right, and in an upward direction.
7W7CH2	Pathway A (including impacts A, A1) is consistent with a bullet traveling from side 1 to side A, left to right, and in an upward direction.
83QU DP	[No Conclusions Reported.]
8732ET	The bullet struck the wall 8.5 cm above the bottom edge and 6.5 cm to the right of the left edge of the wall. The bullet was traveling upward at an approximately 12 degree angle from horizontal and from left to right, at an approximately 96 degree angle from the wall surface.
8FTMH7	The trajectory of the bullet through the wall was 10.9 degrees upwards and 82 degrees left to right. The uncertainty of measurement is +/- 5 degrees.
94V2TM	The target surface is a yielding surface made of wood. I observed perforating defect with an entrance defect on side 1 with a corresponding exit defect on side A. The flight path rod indicated a trajectory of left to right and upward. Vertical measuring 84 degrees, Horizontal measuring 13 degrees.
9DFC3E	The following bullet related damage was observed: Bullet hole in the face of the submitted section of partition wall marked "1." The bullet traveled upwards in a front-to-rear and slight left-to-right direction and passed through the wall, exiting the face marked "A."
9DHZJR	The bullet path is consistent with a bullet entering side 1 of the wall section (Item AD) and exiting side A with an upwards angle of approximately 13 degrees from horizontal and traveling from left to right at an angle of approximately 84 degrees from the wall surface. The angles reported are used as descriptors and are not meant to be interpreted as quantitative forensic test results.
9RK9N2	Item 1 section of partition wall has a perforating bullet hole with the entrance bullet hole defect located on the side marked as "1" and the exit defect on the side marked as "A". The bullet pathway is from left to right and upward through the section of partition wall when viewed from the entrance bullet hole defect side marked as "1". The vertical angle was measured as approximately 11 degrees (+/- 3 degrees) upward angle on the exit side marked as "A". The azimuth/horizontal angle was measured from left to right at approximately 83 degrees (+/- 3 degrees) on the entrance side marked as "1"
A93RVT	Report Conclusions: The entrance hole has been identified as the one labeled number 1. The direction of the shot is from left to right, with a drift angle (azimuth) of $80^{\circ}$ from the shooter's perspective. The inclination angle of the shot is upward, with a value of $80^{\circ}$ , also from the shooter's perspective.

TABLE 4

WebCode	Conclusions
ABB4DU	The trajectory can be determined by identifying the entry perforation with the number "1" and the exit perforation with the letter "A", written as follows: Perforation identified with the number "1": an entry perforation produced by a projectile fired by a firearm, located in the middle part of a wooden box, on the side marked with the number "1", of the wooden box of the ITEMS proficiency 24-5620. Perforation identified with the letter "A": An exit perforation produced by a projectile fired by a firearm, located in the upper middle part of the side marked "A" with an inside-out orientation, of the wooden box of the ITEMS of proficiency 24-5620. Final draft of the Trajectory: An entrance perforation produced by a projectile fired with a firearm, identified with the number "1", located in the middle part of a wooden box, on the side marked with the number "1", with trajectory from left to right, from bottom to top, from outside to inside, with a vertical angle of 11.40° and a horizontal angle of 6.60°, the projectile in its path produces an exit perforation, identified as A, located in the upper middle part of the side marked "A", subsequently the projectile is lost outside the box Teste No. 24-5620. Top.
B3TTX9	The section of partition wall displayed two areas of damage consistent with having been caused by the passage of a fired bullet. The first area of damage marked as "1" is consistent with the entry and passage of a fired bullet. The second area of damage marked as "A" is consistent with the exit and passage of a fired bullet. Utilising a probe, protractor, plumb line and spirit level. I determined that the fired bullet followed a trajectory entering through the "section of partition wall" at the area of damage marked as "1" and exiting the "section of partition wall" at the area of damage marked as "A" The fired bullet followed an upwards (vertical) trajectory at approximately 10 degrees, plus or minus 5 degrees and horizontal trajectory traveling left to right at approximately 83 degrees, plus or minus 5 degrees.
BDEYWX	Pathway A (including impacts A, A1) is consistent with a bullet traveling from side 1 to side A, left to right, and in an upward direction.
BPA9HK	The box has sustained perforating damage caused by a bullet entering side 1 and exiting side A. The track is left-right and upwards.
BX3LDE	A perforating bullet defect (1) was in the partition wall. A trajectory rod was utilized and the bullet path trajectory was left to right and upward. The RTC360 3D Scanner was used to scan the trajectory rod. The raw scan data (Lab Item 1) was registered in Reg360 (Lab Item 1.1). The registered scan data was opened in Map 360 and a trajectory cone was created from the data set. The azimuth angle was 81 degrees and the vertical was +11 degrees.
BZRPAR	Damage to the wall, Exhibit 1, is consistent with having been caused by a projectile entering side "1" and exiting side "A" traveling at an upward angle in a left to right direction.
CFCZAY	Impact 1A is an entrance hole, and the bullet travelled from side 1 towards side A, exiting at impact 1B. The bullet that created Impact 1A travelled 10 degrees (+/- 5 degrees) upward, and 82 degrees (+/- 5 degrees) left to right from the surface of the wall/partition.
CRRMLL	Through analysis and inspection of the square wooden box and evaluation of the physical characteristics of the perforations the following was determined : That they are consistent with the passage of fired bullet projectile. Number 1 in a path from left to right from bottom to top, exiting as described in letter A.
CV4WAA	Side 1 of the wooden block has an apparent bullet entry hole and side A has an apparent bullet exit hole. The bullet traveled through the wooden block in an upward direction at a vertical angle of approximately 11 degrees. It traveled from left to right at a horizontal angle of approximately 82 degrees.
CZ396A	Item 001-1 is a section of a partition wall with labels affixed on three of the sides: Side 1, Side A, and Top. Sides 1 and A each have an apparent bullet hole while the "Top" label is for orientation purposes. Side 1 has apparent bullet wipe material around the hole. Side A exhibits displacement of substrate material in and around the hole with no apparent bullet wipe. Side 1 is consistent with an entrance bullet hole while Side A is consistent with an exit bullet hole. I placed Item 001-1 on a level surface and inserted a trajectory probe through the entrance and exit holes. I measured the vertical angle using a digital inclinometer and determined the upward angle to be approximately +10 degrees (±5 degrees). I used a zero-edge protractor to measure the horizontal (azimuth) angle and determined the left to right angle to be approximately 82 degrees (±5 degrees). I also photographed Item 001-1 and verified the vertical and horizontal angle measurements using the printed photographs and a zero-edge protractor.

TABLE 4

WebCode	Conclusions
DQQC3N	From the shooter's perspective, the shot was ten degrees up and seven degrees from left to right. The measurements should be considered descriptive and not forensic quantitative results.
EJQADG	For the vertical angle, digital angle meter has been used. For the horizontal angle we calculated the angle from the baseline which starts from the right side and ends at left side, after getting the value we subtract the value by 90 to get the azimuth angle.
EVZUXA	There was a perforating bullet defect to Side 1 of the box. The vertical angle was upward at 10.1 +/- 2.6 degrees. The azimuth angle was left to right at 84.3 +/- 2.6 degrees.
EWBWJ9	Trajectory A - entry into side 1 and exits from side A. Trajectory A is traveling at an upward, vertical angle of 10 degrees with a +/- 5 degree reasonable measurement variance; and traveling left to right, with an azimuth angle of 82 degrees (or 8 degrees from orthogonal) with a +/- 5 degree reasonable measurement variance.
F3GPD4	Taking the wooden box and a plumbob I shot a line from top to bottom of side '1' with the line running past the edge of the entry hole. I then marked the position of the line on each edge of the box. I repeated this process marking the level edges on the left and right edge of side '1' as well. This will allow me to place a protractor next to the bullet hole aligned with the two markers allowing for a level reading to be taken. I then placed a trajectory probe/rod through the entry hole and fed it out the exit hole. The positioning of the probe/rod is indicative of the bullet path through the wooden box. Placing a protractor next to the rod, aligned top and bottom, I position it so the centre line (90 degrees) is on the bottom edge of the entry hole. I then positioned myself perpendicular to the flat front face of the protractor and left side of the wooden box and read the degree point where the rod extends over the edge of the protractor. With the 90 degree point being zero, the position the rod indicates read as 11 degrees. This relates to an 11 degree upwards angle. Placing the protractor next to the rod aligned left to right, I position it so the centre line (90 degrees) is on the left edge of the entry hole. I then positioned myself perpendicular to the flat front face of the protractor and bottom side of the wooden box and read the degree point where the rod extends over the edge of the protractor. The position the rod indicates read as 82 degrees. This relates to an 82 degree left to right angle. Utilising both readings and observations I am of the opinion that the damage to the wooden box was caused by the discharge of a bullet from a firearm, with an 11 degree upwards and 82 degree left to right trajectory. This in short would be referred to as a slightly left to right, slight upwards, front to back trajectory.
FG26G4	Observation: 1. Mark 1 > The wood fibers are forced inward. The edge of the hole is smooth and circular. Visible deposits of bullet wipe around the margin of the hole. 2. Mark A->The wood fibers are ragged, irregular and lacking bullet wipe. 3. Use lead or copper test to make sure 1 is a hole caused by a bullet. 4. There are no apparent visible gunshot residues on the wooden object surface . 5. The size of the hole is close to 9 mm in width and length. It is near orthogonal impact. 6. Take a probe to insert through wooden object to make sure the bullet's path. 7. Measure the angular component of the projectile's path. Conclusion: 1. According to the lead/copper test result and observation, mark 1 is the entry hole and mark A is the exit hole. 2. Lack of visible soot and unburned powder particles deposited around the entry bullet hole in the wooden object. The range-of-fires could be distant. 3. Trajectory is 1->A. The bullet passed through from left to right with 5 degree and upward with 10 degree angle .
FQ7ENT	The bullet path entered the wooden box at an upward angle and traveled from left to right.
FRXBCM	A bullet entered side 1 of the wall and exited side A of the wall 7° (+/- 1°) left of the vertical plane and 11° (+/-2°) below the horizontal plane. The bullet traveled in an upward direction from left to right.
FZU7AL	Side 1 of the section of wall has what appears to be an entrance hole. Side A of the section of wall has what appears to be an exit hole. Assuming that the holes in the section of wall were made by a bullet, the trajectory for the bullet is upward and from left to right. The vertical angle is approximately 12 degrees (upward) and the horizontal angle is approximately 84 degrees (left to right).
GB8RWR	A section of a partition wall (Exhibit 1) with a suspected bullet hole was submitted to the [State] Police Crime Lab for Trajectory Analysis. Trajectory Analysis indicated that one shot was fired into the partition wall (Exhibit 1). One bullet entered the side labeled 1 and exited the wall on the side labeled A. This trajectory is from left to right at an upward angle, and is consistent with the shooter being located on side 1 of the wall shooting towards side A. No bullet or bullet fragments were recovered from this shot.

TABLE 4

WebCode	Conclusions
GNUW33	A projectile has perforated the wall at marker 1 and exited at marker A. The projectile has travelled in an upwards direction with left to right directionality.
GUYVDR	[No Conclusions Reported.]
GVEXLL	The projectile perforated the structure from left to right 5° from 90° and in an upward direction at 11.7 degrees. Degree of uncertainty is 5° for both measurements.
H79VMQ	Bullet path labeled A, entered the side of the wall labeled "1", traveled at an upward angle from left to right.
HAUFUF	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. Trajectory i1: Projectile entered the surface marked 'i1' upward at 10 degrees (plus or minus 5 degrees) and from left to right at 84 degrees (plus or minus 5 degrees), based on the shooter's perspective.
HB6HFE	The holes in the partition wall, item 1, were created by the passage of a single bullet. This bullet entered the partition wall, item 1, on the side labelled "1" and exited from the side labelled "A". The bullet travelled upward at a vertical angle of approximately 11 ± 5 degrees and at a horizontal angle of approximately 82 ± 5 degrees from left to right (viewed facing the side of the partition wall labelled "1").
HEKP4E	The azimuth angle was approximately 6 degrees left of perpendicular. The vertical angle was approximately 10 degrees down from perpendicular. When facing the target, the path of travel of the bullet was left to right and at an upward angle.
HHJ927	A defect in the board consistent with a bullet impact traveled front to back, left to right, and upward.
HKRDGF	Item 1 had two apparent bullet defects consistent with damage from a projectile. The side labeled 1 appeared to be an entrance, and the side labeled A appeared to be an exit. A trajectory rod was placed, and measurements were taken. The projectile path was left to right and upward. A horizontal angle of 6 degrees measured from perpendicular, from left to right and a vertical angle of 12 degrees upward were obtained. Both angles had an uncertainty of +/- 5 degrees, which is generally accepted in the field of shooting reconstruction. Horizontal Angle: 6 +/- 5 degrees, measured from perpendicular Vertical Angle: 12 +/- 5 degrees upward
HMFR7P	Two perforating defects that are consistent with those produced by a fired projectile, were observed in a section of wall measuring approximately 5 3/4 inches x 6 inches. After an examination of the defects, the trajectory was determined to be as follows: A fired projectile entered the side marked, "1" and exited the side marked "A" at a 9 degree (+/-5) upward angle (vertical) and an 83 degree L -> R (+/-5) angle (horizontal).
JFC7TF	One perforating hole type defect was observed in the wall which is consistent with the passage of a bullet projectile. The projectile entered the "1" side of the wall and exited the "A" side. The projectile traveled thru the wall in an upward angle of approximately 10 degrees and a left to right direction of approximately 83 degrees.
JQCZM6	One perforating entry defect was to side 1, and exited side A. The bullet directionality was 81.9 degrees left to right, and 13.6 degrees upward. All reported azimuth and vertical angles were measured from fitted trajectory rods scanned using a Trimble X7 3D laser scanner. The reported uncertainty for azimuth and vertical angles measured from the trajectory rods is expanded using a coverage factor k=2 for a level of confidence of approximately 95%, assuming a normal distribution. The expanded uncertainty represents the uncertainty of the 3D laser scanning method of measuring azimuth and vertical angles from trajectory rods only.



TABLE 4

WebCode	Conclusions
KZWQM3	The side of the box with the label that read, "Test No. 24-5620 1" had a hole that had gray material around the bottom margins of the defect and most of the wood fibers/particles were pushing inward. In my opinion, this hole was determined to be the entrance hole. The side of the box with the label that read, "Test No. 24-5620 A" had a hole with the damage around the hole and most of the wood fibers/particles pushing outward. In my opinion, this hole was determined to be the exit hole. The location of the damage was measured. A trajectory probe was placed through the two holes to determine the bullet path. Facing the "1" side of the box with the "Top" side up, in my opinion, the projectile had travelled slightly left to right, and upward through the wall.
L32E3R	Based on the analysis, the bullet entered through label 1 and exited through label A. The azimuth angle of $82.5^{\circ}$ ( $\pm 1.5^{\circ}$ ) indicates that the bullet traveled from left to right, while the vertical angle of $11.7^{\circ}$ ( $\pm 1.7^{\circ}$ ) suggests an upward trajectory. The direction of travel is determined from the perspective when viewing the side of the item where label 1 is attached.
LJ4DPL	A wood block with two suspected bullet holes (labeled 1 and A) was submitted to the laboratory for trajectory analysis. Shot 1/A - One bullet entered into the wood block at hole 1 and exited at hole A. The trajectory of this shot is consistent with one bullet traveling from left to right in an upward direction. No bullet was recovered from this shot. This laboratory does not report angle determinations.
LPQ4CG	The box is damaged by one bullet, approx. diameter - 7-8 millimeters. The direction of the bullet is from "1" to "A". The lesion is directed from the bottom to top with 10 degrees and from the left to right with 10 degrees.
LTRAQM	The trajectory of the bullet is 10.5 degrees upward and 83 degrees from left to right.
M3BZQK	Pathway B (including impacts B and B1) is consistent with a bullet traveling from side 1 to side A, left to right and in an upward direction.
MB69BB	An entry hole was observed on the side of wooden box labeled as "1" while an exit hole was observed on the side of wooden box labeled as "A". The probability of a single gun shot cannot be ruled out. The direction of bullet travel was determined to be from left to right in upward direction.
MCKD73	Note: Positive vertical angles represent an upward trajectory while negative vertical angles represent a downward trajectory. In addition, horizontal angles were measured left to right (at defect 1). Defect 1: Partition wall This bullet perforated the wooden wall at defect 1 (primary impact) and traveled upward perforating the wooden wall at defect A (secondary impact). The bullet path had a vertical angle of 12 degrees and a horizontal angle of 81 degrees.
MGRYVK	Considering that the shooter stands in front of the side (1), we can there for say that the shot goes from side 1 to side A, from the left to the right with an angle of $10^{\circ}$ and from the bottom to the top of the item with an angle of $13,15^{\circ}$ .
MXFAK9	For the vertical angle, digital angle meter has been used. For the horizontal angle we calculated the angle from the baseline which starts from the right side and ends at left side, after getting the value we subtract the value by 90 to get the azimuth angle
N6TKBE	Hole 1 is nearly round with abrasion ring, and wood fibers were pushed inward. The shape of Hole A is more irregular than Hole 1, and wood fibers were pushed outward. Therefore, it's determined that Hole 1 is the entrance and Hole A is the exit hole. The Hole 1's center is located 7 cm from the left edge and 8.7 cm up from the bottom of the wall particle. Place a trajectory probe through Hole 1 and Hole A to reconstruct the shooting path. Facing the side of the hole 1, the direction of travel of the bullet is left to right at 82 degrees from the surface of the wall, and at upward angle at 11.5 degrees from the baseline.
ND7ENV	The shot was discharged with a slight left to right azimuth and upward trajectory.
NDQCJ9	The two (2) holes in the submitted partition are consistent with the passage of a bullet, entering side 1 and exiting side A. The trajectory of this bullet/projectile is from a downward to upward direction at approximately 10.9 degrees upward from the horizontal plane and approximately 82.5 degrees anticlockwise in the horizontal plane (from left to right, facing side 1 with the vertical partition on the left as the starting reference point).

TABLE 4

WebCode	Conclusions
NMU6BN	Examined visually. Defect side 1 entrance (3/8 inch diameter) located 2 1/2 inches below the top edge of the wooden box and 2 1/2 inches right of the left edge of the wooden box. No fouling was observed visually. No powder grains were observed visually. A wipe-off rim was observed visually. The presence of a wipe-off rim around defect side 1 entrance supports that defect side 1 entrance is an entrance bullet defect. Defect side A exit (3/4 inch length x 1/2 inch width) located 2 inches below the top edge of the wooden box and 2 3/4 inches right of the left edge of the wooden box. No fouling was observed visually. No powder grains were observed visually. No wipe-off rim was observed visually. The bullet traveled through the wooden box, entering side 1 and exiting side A. The direction of travel of the bullet was 7 degrees from the perpendicular left to right and 11 degrees upward.
NP68Y8	The probable bullet trajectory was given an entrance defect labeled "1" and an exit defect labeled "A". The bullet entered the wood at defect 1, continued through the wood and exited out of defect A. The bullet entered into defect 1 in a left to right path of travel at approximately 7 degrees, with an upward angle of approximately 11 degrees.
NQAYPZ	A perforating bullet defect was on side 1 of the box, with the exit defect on side A. The general directionality of the bullet was slightly left to right and upward. The azimuth angle measured 83.4° +/- 2.6° from side 1 of the box, and the vertical angle measured 10.9° +/- 2.6° upwards.
NTZ2W9	I received a square piece of unvarnished and unpainted wood composed of six sides, where three of the sides are marked as 1, top, and A. Through analysis and inspection of piece of evidence 1 and evaluation of the physical characteristics of the perforations, the following was determined: That they are consistent with the passage of a fired bullet projectile. Number 1 in trajectory, (upward), from left to right . It has a vertical angle of 78 and a horizontal angle of 80.
PQUVU9	Laboratory Report On 9/17/2024, I (Crime Scene Investigator [Name]) was assigned the task of examining a section of wall to determine angle of impact from a bullet strike. I retrieved the section of wall from the Evidence room with the assistance of Sgt. [Name/Badge #]. Tests: I observed the section of wall to be sealed inside a small white cardboard box. I observed the section of wall to be made of 1/2" plywood and approximately 6" X 6" X 3" is size. I further observed the section of wall to be unpainted. I observed the section of wall to be marked top, side 1 and side A. I observed a single bullet strike on side 1 of the wall, with the bullet exit on side A of the wall. I took digital photographs of the section of wall as I found it to be. Results: The vertical angle of the bullet strike is approximately a 10-degree angle traveling left to right at an upward angle. The horizontal angle of the bullet strike is approximately 85-degrees left to right. Disposition: The section of wall was repackaged and returned to the Evidence room. All digital photographs were uploaded to Foray. Conclusion: Examination of the section of wall was concluded on 9/23/2024. Laboratory processing notes were completed and forwarded to Sgt. [Name] for review. No further analysis is pending in this case.
PZGWBH	Bullet has penetrated the wall at the angle of 81 degrees from left to right and 78 degrees from down to up. Perpendicular to the wall is 90 degrees. Uncertainty for the measurements is ± 5 degrees.
Q72CEF	Pathway E (including impacts E, E1) is consistent with a bullet traveling from side 1 to side A, left to right and in an upward direction.
QFPA6K	The trajectory for the apparent path (A) of the bullet travelled at an upward angle from left to right. I did not recover a bullet from this area.
QKK2BW	The direction of travel of the projectile thru Item 1 was determined to be from side 1 to side A, left to right and upward. As measured from entrance side (side 1), the vertical angle was determined to be 11 degrees (upwards). As measured from the left edge of side 1 towards the right side, the horizontal (azimuth) angle was determined to be 81 degrees.
R7E9JK	[No Conclusions Reported.]
R9LNTB	The entrance hole is situated in face (1) and the exit hole is situated in face (A). The direction of travel of the bullet through the box is oriented from the left to the right and upward. The horizontal angle of the trajectory with the normal of the surface has been measured 12.1° +/- 1.5°. The vertical angle of the trajectory with the normal of the surface has been measured 6.1° +/- 1.1°.

TABLE 4

WebCode	Conclusions
RB93GL	The trajectory is described regarding 3 references planes: horizontal plane (parallel to top and bottom faces), transversal plane (parallel to 1 and A faces), longitudinal plane (perpendicular to both other planes). The bullet progressed through the box from face 1 (entrance hole) to A (exit hole) on an axis oriented upward with an angle of 10° from horizontal plane, and from left to right when following the bullet path with the angle of 7° from the longitudinal plane.
RFMWY4	The trajectory of the bullet that created these holes was from 1 to A (1 entrance, A exit), left to right, and slightly upwards. The trajectory was determined using a trajectory rod and the angles were determined using a protractor and inclinometer.
RJGYX	Defect 1: This bullet perforated the wood box from defect 1 (primary impact) through defect A. The bullet path has a horizontal angle of 83 degrees and a vertical angle of 11 degrees. Note: Horizontal (azimuth) angles were measured from left the right in relation to the side labeled 1. Positive vertical angles represent an upward trajectory while negative angles represent a downward trajectory.
RM73WB	One bullet hole was observed in the wooden box with an entry hole on side 1 and an exit hole on side A. The projectile traveled in a slight upward angle from the left to the right. The angles were determined to be 10° below the horizontal plane and 8° to the left of the vertical plane.
T46F6C	I examined the section of the partition wall. I identified two (2) holes in the partition wall. These holes were created by the passage of a single bullet. The side labelled "1" was identified as the entrance hole and the side labelled "A" was identified as the exit hole. The entrance hole was located approximately 6.2 centimeters from the top edge of the partition wall and approximately one and 6.9 centimeters from the left hand side of the partition wall. The exit hole was located approximately four and a half 5.1 centimeters from the top edge of the partition wall and 7.05 centimeters from the left hand side of the partition wall. The bullet travelled upward (below the horizontal) at a vertical angle of 79 ±2 degrees and a horizontal (azimuth) angle of 77 ±2 degrees from left to right.
T89DF6	It is a perforation in a wood surface in a circular shape with physical characteristic of a defined edge located on #1 that passes through a wood surface in a irregular shape with physical characteristic of wood detachment located on letter A. That side #1 represents the entrance and side letter A represents the exit. The path is from left to right upwards. The vertical angle is 78 degrees and the horizontal angle is 84 degrees.
TKCWQ6	The bullet impact indicates a horizontal trajectory 9 degrees from perpendicular, moving from left to right and a vertical trajectory 11 degrees from perpendicular, moving upward.
TMZBFE	Approximate trajectory measurements were recorded. The entrance defect was located on Side 1 and the exit defect was located on Side A. Trajectory appears to be upward, left to right.
TVUDJB	The bullet entered side(1) of the box and exited side (A) upward from left to right.
U6DAZ3	I received a square piece of wood composed of six sides, where three of its sides are marked as 1, top, and A. Through analysis and inspection of piece of evidence 1 and evaluation of the physical characteristics of the borehole, the following was determined: That they are consistent with the passage of a fired bullet projectile. Number 1 in trajectory, from left to right from top to bottom. It has a vertical angle of 79 and a horizontal angle of 81.
UQTUW3	1. One (1) plywood wall consisting of two (2) defect sites. D1- One (1) circular in shape perforating bullet hole, approximately 5/16" x 5/16" in diameter. Located approximately 3 3/4" up from the bottom of the wall and approximately 2 1/4" from the left side edge of the wall. This is consistent with an entry bullet hole traveling in an upward/vertical angle of approximately 7 degrees and a leftward/horizontal angle of approximately 12 degrees. the bullet traveled approximately 3" through the wall and exiting through the back of the wall. One (1) rectangular in shape bullet hole, approximately 3/8" x 5/8" in size identified as D1a. Located approximately 3 3/4" up from the bottom of the wall and approximately 2 5/8" from the left side edge of the wall. No projectile recovered.
UZ4TQE	A section of a partition wall (Exhibit 1) with a suspected bullet hole was submitted to the [State] Police Crime Lab for Trajectory Analysis. Trajectory Analysis indicated that one shot was fired into the partition wall (Exhibit 1). One bullet entered the side labeled 1 and exited the wall on the side labeled A. This trajectory is from left to right at an upward angle, and is consistent with the shooter being located on side 1 of the wall shooting towards side A. No bullet or bullet fragments were recovered from this shot.

TABLE 4

WebCode	Conclusions
VPGEZG	The section of submitted wall was found to have a pair of defects. A single bullet likely perforated this section of the submitted wall on surface 1 and exited from surface A. The trajectory, from an observer facing surface 1, was estimated to be $12^{\circ} \pm 5^{\circ}$ upwards and $83^{\circ} \pm 5^{\circ}$ left to right.
VR6NC4	The bullet path perforated the section of wood wall entering at H1(Side 1) and exiting at H2(Side A). The bullet path was determined to have an upward trajectory of approximately 10 degrees +/- 5 degrees of uncertainty, and an azimuth of approximately 8 degrees +/- 5 degrees of uncertainty off the perpendicular traveling from left to right.
WV7WET	A near-circular perforating entrance bullet defect (Defect A) was located on side '1' of the partition box. The bullet exited side 'A' of the box (Defect A exit). The general directionality of the bullet associated with these defects was from side '1' to side 'A', upward, and left to right.
W3LWBG	I observed and photographed what appeared to be a perforating impact on a section of a partition wall. The probable projectile path is from side 1 through side A in an upward and left-to-right orientation if viewed from side 1. The azimuth angle was 83 degrees +/- 5 degrees and the vertical angle was 12 degrees +/- 5 degrees. The entrance was determined to be on side 1 (Impact (Marker 1)) due to the relatively smooth margins, inward beveling, bullet wipe, and round shape observed: all of which are typical characteristics of entrance holes in wood. The exit was determined to be on side A (Impact (Marker A)) due to the irregular margins, "pushed out" wood fibers, and the flaking/splintering observed: all of which are typical characteristics of exit holes in wood. Impact (Marker 1) appeared to be near orthogonal. This would be consistent with the near 90 degree azimuth and near 0 degree vertical angles measured: near perpendicular impact to the surface.
W8FWNQ	The bullet traveled through the box at approximately 11* in an upward direction, moving about 7* from left to right (from 90*).
W9LGBQ	The section of wall, item 1, has two (2) defects labeled "1" and "A" that are both consistent with a perforating gunshot. Defect "1" is consistent with being the entrance and defect "A" is consistent with being the corresponding exit. The trajectory is upwards at approximately 12 degrees (with an uncertainty of +/- 5 degrees) and from left to right with an azimuth angle of approximately 81 degrees (with an uncertainty of +/- 5 degrees).
WDFB9R	A single slightly elliptical perforating defect with defined margins and what appears to be lead wipe around the perimeter is present on Side 1. The defect is approximately 9mm across its Major Axis and 7mm across its Minor Axis. The center of the defect is located approximately 8.5cm from the bottom edge of Side 1 and 6cm from the left edge as you look at it. A single corresponding defect is present on Side A. This defect is irregular in shape with blow out and portions of the substrate missing. The center of the defect is located approximately 9.5cm from the bottom edge of Side A and 8cm from the left edge as you look at it. A trajectory rod was placed through the two holes to visually demonstrate the flight path of the projectile through the wall, which revealed a general trajectory of left to right and upward. An azimuth of $84^{\circ}$ left to right was obtained using a zero-edge protractor. Using an inclinometer, the vertical angle was determined to be $9^{\circ}$ upward. In conclusion, a single projectile traveling at an $84^{\circ}$ angle left to right and $9^{\circ}$ upward, perforated the wall on Side 1 and exited on Side A, causing both defects.
WLD4J8	The bullet traveled through the partition wall from side 1 to side A at an upward angle of approximately 11 degrees from the horizontal and at a left to right angle of approximately 6 degrees from the perpendicular of the partition wall surface.
WMTZC8	[No Conclusions Reported.]
WQTB88	The fired bullet entered in the sample and drill the hole 1 to exited through the hole A. The trajectory of this bullet is upward with a $10,15^{\circ}$ angle and from left to right with a $7,7^{\circ}$ angle.
WYKULF	The bullet associated with impact 1A enters on wall "1" and perforates the wall and exits at impact 1B on wall "A". The path has an upward trajectory of 12 degrees (+/- 5 degrees) and a left to right trajectory of 83 degrees (+/- 5 degrees).
X2LEMK	Trajectory: '1' to 'A'. Upwards = +10 degrees (vertical angle). Left to right = 83 degrees (horizontal angle) or 7 degrees from the perpendicular.

TABLE 4

WebCode	Conclusions
XPDCNH	Impact 1 is a perforating entrance hole on side 1 of partition. Impact 1 has a vertical angle of approximately 14 degrees (+/- 5 degrees) upward and an azimuth (horizontal) angle of approximately 82 degrees (+/- 5 degrees) left to right travelling from side 1 to side A.
Y87UT3	Item AD is a wooden box with perforating bullet damage that entered on side 1 and exited on side A. The bullet trajectory was upward twelve (12) degrees from horizontal and five (5) degrees from left to right.
Y9ZHBV	Examination of the submitted section of partition wall revealed the presence of two areas of damage consistent with the passage of a projectile. A defect with the characteristics of a bullet entry was present on side 1 of the wall with a corresponding exit on side A. The path of the projectile was determined to be from left to right at approximately 82 degrees (+/- 5 degrees) from the surface of the wall and upward at approximately 10 degrees (+/- 5 degrees).
YGRZP8	Pathway A (including impacts A, A1) is consistent with a bullet traveling from side "1" to side "A", left to right and in an upward direction.
YW9TFY	1. Item 1 presented holes produced by a bullet. 2. The direction of travel of the bullet through the box was from outside to inside, from right to left, from front to back and upward.
Z2GEZP	The item to be examined was a section of a partition wall. This wall had been designated as "1" on one side of the wall and "A" on the other. One suspected bullet hole was present on each side of the wall. I documented these corresponding holes with scaled photographs. A trajectory rod was used to document the apparent path of the projectile that had perforated this partition wall. The projectile had perforated the partition wall entering side 1 and exiting side A. The projectile had traveled slightly left to right with an upward angle.
Z6EX4A	A perforating bullet hole (A1) was in the front side of the wall partition. A corresponding bullet hole (A2) was in the back side of the partition. Bullet path labeled A, entered the wall partition, at an upward angle and traveled from left to right.
Z8KHRA	Pathway J (including impacts J, J1) is consistent with a bullet traveling from Side 1 to Side A, left to right, and in an upward direction.
ZDBR28	The wood wall section, Item 1.1, has an entrance bullet hole, Hole A, in the top left quadrant of Side 1, and an exit hole, Hole A2, in the top left quadrant of Side A. The general bullet path A to A2 was from Side 1 of the wall section towards Side A, from the left towards the right, and upward. The trajectory angles for bullet path A to A2 measure 6 degrees (+/- 5 degrees) left of perpendicular to Side 1 of the wall section and 11 degrees (+/- 5 degrees) upward. NOTE: Left/right and up/down designations are based on the side labeled "Top" being up and left and right sides based on facing the side labeled as "1".
ZHJFE9	There is a single perforating bullet impact to a wooden surface. There is evidence of bullet wipe present on the entry surface and splintering of the wood on the exit surface. The bullet traveled left to right in an upward trajectory. The azimuth angle measured approximately 85 degrees and + 17degree vertical.
ZQYYWM	An object perforated a wooden box. The object entered the side labeled "1" with a left to right and upward direction. This same object exited the same wooden box with the side labeled "A."
ZR7E6E	On the wooden box's surface plane labeled "Test No. 24-5620 1", I observed a defect that appeared to be consistent with damage from a fired projectile perforating into the surface. A gray-black ring was observed around the defect that appeared to be consistent with bullet wipe, indicating the direction of travel into the surface. I labeled this defect with Scale A. The path of travel appeared to continue and the corresponding exit hole was observed in the wooden box surface plane labeled "Test No. 24-5620 A". The damage observed at this defect was consistent with damage from a fired projectile exiting the wooden surface. I labeled this defect with Scale A1. A trajectory rod was used for illustrative purposes. Approximate measurements were collected from the defects, including horizontal and vertical angles. Approximate measurements showed the projectile's path of travel to be approximately 82* from left-to-right and slightly upward at approximately 11.5*.

# Additional Comments

TABLE 5

WebCode	Additional Comments
32Q3DL	All reported azimuth and vertical angles were measured from fitted trajectory rods scanned using a Trimble X7 3D laser scanner. The reported uncertainty for azimuth and vertical angles measured from the trajectory rods is expanded using a coverage factor $k=2$ for a level of confidence of approximately 95%, assuming a normal distribution. The expanded uncertainty represents the uncertainty of the 3D laser scanning method of measuring azimuth and vertical angles from trajectory rods only.
368PMK	Measured azimuth from the right side of the trajectory rod. Vertical is +12 degrees, upward.
3BWATL	All reported azimuth and vertical angles were measured from fitted trajectory rods scanned using a Trimble X7 3D laser scanner. The reported uncertainty for azimuth and vertical angles measured from the trajectory rods is expanded using a coverage factor $k=2$ for a level of confidence of approximately 95%, assuming a normal distribution. The expanded uncertainty represents the uncertainty of the 3D laser scanning method of measuring azimuth and vertical angles from trajectory rods only.
3ETTW7	Our agency does not report out the angle of shots.
47HRB6	Our agency does NOT report out the angles of shots.
4ZRGYL	we do not report the angles, therefore we do not have an uncertainty associated with them
8732ET	The distances and angles reported are used as a description and are not meant to be interpreted as a quantitative forensic test result.
9DFC3E	Uncertainty of Measurement not reported. Angle measurements are for reference only and are not included in report conclusions.
A93RVT	Based on the measurements of the hole, the caliber of the bullet would be 7.65 mm.
ABB4DU	The objective of the ballistic trajectory is to determine the distance and position of the shooter, to search and fix evidence, which is why it becomes necessary to carry it out at the scene, since the necessary elements are available to obtain an efficient result.
CV4WAA	Measurements are approximate.
DQQC3N	This test was used as an internal proficiency and the results will not be submitted to [Accreditation Body].
EVZUXA	All reported azimuth and vertical angles were measured from fitted trajectory rods scanned using a Trimble X7 3D laser scanner. The reported uncertainty for azimuth and vertical angles measured from the trajectory rods is expanded using a coverage factor $k=2$ for a level of confidence of approximately 95%, assuming a normal distribution. The expanded uncertainty represents the uncertainty of the 3D laser scanning method of measuring azimuth and vertical angles from trajectory rods only.
FQ7ENT	Angles are not reported per our standard operating procedures and our unit does not calculate uncertainty of measurement for angle determination; therefore, the uncertainty of measurement fields are left blank.
FZU7AL	Angle measurements are used for descriptive purposes only and are not quantitative forensic test results.
GB8RWR	Per our policy and procedures, we do not report angles.
H79VMQ	Our SOP's do not allow for reporting measurements of angles in our reporting. Additionally, we do not calculate for measure of uncertainty in angle measurements and is therefore not reported.
HHJ927	Measured the horizontal angle from the right side of the rod.
KZWQM3	*Our laboratory does not report the measured azimuth and vertical angles as an uncertainty of measurement budget has not been performed.
MGRYVK	The ballistic orifica has an diameter of 9 mm on side (1).
N6TKBE	The record of uncertainty is left blank, cause our lab doesn't calculate the uncertainty of angle measurement.

TABLE 5

WebCode	Additional Comments
NQAYPZ	All reported azimuth and vertical angles were measured from fitted trajectory rods scanned using a Trimble X7 3D laser scanner. The reported uncertainty for azimuth and vertical angles measured from the trajectory rods is expanded using a coverage factor $k=2$ for a level of confidence of approximately 95%, assuming a normal distribution. The expanded uncertainty represents the uncertainty of the 3D laser scanning method of measuring azimuth and vertical angles from trajectory rods only.
NTZ2W9	Side A - unvarnished and unpainted wooden surface with an exit perforation with the following characteristics: circular hole with irregular edges, absence and detachment of pieces around the perforation. Side 1 - unvarnished and unpainted wooden surface with an entrance perforation with the following characteristics: circular hole with regular, smooth edges in which a slight mark of an addition ring is observed on its edges. Top side - unvarnished and unpainted wooden surface with no perforation.
RM73WB	Angle measurements are based on a horizontal and vertical plane from the entry hole. Horizontal measurement - $10^\circ$ below the horizontal plane Vertical measurement- $8^\circ$ to the left of the vertical plane
TVUDJB	vertical angle=80 horizontal angle=85
U6DAZ3	Side 1 - unvarnished and unpainted wooden surface with an entrance perforation with the following characteristics: circular hole with regular, smooth edges in which a slight mark of an addition ring is observed on its edges Side A - unvarnished and unpainted wooden surface with an exit perforation with the following characteristics: circular hole with irregular edges, absence and detachment of pieces around the perforation Top side - unvarnished and unpainted wood surface with no perforation
UZ4TQE	[State] Police Crime Laboratory does not report angle determinations or measurement uncertainty for Trajectory Analysis.
VW7WET	The reported azimuth and vertical angles were measured from fitted trajectory rods scanned using a Trimble X7 3D laser scanner. The reported uncertainty for azimuth angles measured from the trajectory rods is expanded using a coverage factor $k=2$ for a level of confidence of approximately 95%, assuming a normal distribution. The expanded uncertainty represents the uncertainty of the 3D laser scanning method of measuring azimuth and vertical angles from trajectory rods only.
WDFB9R	Photographs were taken and retained of all defects, trajectory rods, and measurements.
X2LEMK	The side marked 'Test No 24-5620 1' had a circular hole, with some bullet wipe around the circumference, approx. 63mm down from the top edge and 73mm to the right of the left edge. This hole measured approximately 8mm in diameter. The side marked 'Test No 24-5620 A' had a circular hole, with a main, rectangular-shaped defect of damaged wood and splinters. The top of the main defect was approx. 41mm down from the top edge of the box and 57mm to the right of the left edge. The main defect measured approximately 18mm x 25mm. The central hole within the main defect was approximately 51mm down from the top edge and 65mm to the right of the left edge. The central hole measured approximately 7mm x 8mm. There were some wood splinters protruding from the main defect in the direction from '1' to 'A'. There were no other defects noted in the wooden box.
Y87UT3	Degree measurements in this report are for descriptive purposes only and are not quantitative forensic results.
YW9TFY	1. The trajectory analysis was made with reference to the object, not from the shooter. 2. The trajectory of the bullet through the box from the shooter's reference would be from outside to inside, from left to right, from front to back and downward.
Z2GEZP	Our Mobile Crime Unit does not routinely report angles, so angles were not obtained for this test.
Z6EX4A	I believe this test includes fields for uncertainty of measurement. Angles are not reported per our standard operating procedures. Our unit does not calculate uncertainty of measurement for angle determination, thus the uncertainty of measurement field is left blank.
Z8KHRA	Our laboratory does not report angle measurements.
ZQYYWM	Observed dark colored stains in and around the hole on the side marked "1." Observed wood protruding out from the side marked "A."

-End of Report-  
(Appendix may follow)

## Test No. 24-5620: Shooting Reconstruction - Angle Determination

DATA MUST BE SUBMITTED BY **Oct. 07, 2024, 11:59 p.m. EDT** TO BE INCLUDED IN THE REPORT

Participant Code: U1234A

WebCode: B7VNM3

### Scenario:

Investigators have submitted a section of a partition wall 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**

**Questionnaire**

1: What convention scale was used to obtain the azimuth angle (0-90-0, 0-180, 90-0-90, etc.)?

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

A2LA Certificate No.

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

Authorized Contact Person and Title

Laboratory Name

Location (City/State)