



Wound Ballistic Workshop  
September 6, 2002

Ammunition Report

**Portland Police Bureau**

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**Winchester**

Pat Dooley	Distributor
Cindy Dooley	Distributor
Van Bradeen	Jim Ferry @ Associates Factory Representative

## Wound Ballistic Workshop Report

Representatives from Federal Cartridge and Winchester were both present Friday, September 6, 2002 to provide a shot-to-shot comparison of Federal HST vs. Winchester SXT. Both companies provided their own ballistic gelatin, ammunition, chronographs, and demonstration equipment.

Portland Police Bureau had five (5) representatives from Training and SERT Divisions. Both Divisions expressed an interest in Premium Service ammunition that would perform optimally in duty pistols and MP5's.

Federal and Winchester rounds were shot through the FBI test protocol side by side, with the independent verification by Officer Scott Elliot of Portland Police Bureau. All fired bullets were mounted on display boards. The Federal Cartridge display board demonstrates an exact representation of bullets removed, from the gelatin if separations occurred. Please refer to the recorded data to determine the Winchester rounds that experienced core jacket separation as Winchester Representatives glued bullets together for the Winchester Display Board.

Ballistic tests were conducted with 9mm 124 gr., 9mm 147 gr., and 45 Auto 230 gr. ammunition. Randomly selected Portland Police Bureau firearms were used to test each round – Glock 17, Glock 21, and MP5 firearms were used.

Four (4) FBI Protocol Events were shot – Bare Gelatin, Heavy Clothing, Wallboard, Auto Glass (Winchester was only able to provide one piece of Auto Glass so results from their tests were conducted with 10+ rounds through one sheet of glass).

Gelatin Calibration – All gelatin was measured for calibration (temperature  $39^{\circ}\text{F} \pm 2$ , and BB penetration  $3.25'' - 3.75'' @ 590\text{ fps} \pm 20$ ). Both manufacturer's blocks calibrated with temperature, the Federal blocks all calibrated with BB Penetration. Winchester's chronograph had a difficult time picking up the BB's for velocity, and penetration in the Winchester gelatin averaged  $2.75''$ .



**Federal P9HST1  
9mm 124 gr. HST  
fired through a  
H&K MP5  
into the Wallboard  
Test Event**

### **Bare Gelatin**

Federal HST rounds performed flawlessly in all firearms. All rounds had large expansions and deep penetrations. Winchester experienced core jacket separations.

### **Heavy Clothing**

Federal HST rounds performed flawlessly in all firearms. All rounds had large expansions and deep penetrations. Winchester reversed the heavy clothing on the gelatin to provide a target for the shooter. Winchester 9mm 127 and 147 gr. rounds experienced core jacket separations with the MP5.

### **Wallboard**

Federal HST rounds performed flawlessly in all firearms. All rounds had large expansions and deep penetrations. Winchester experienced core jacket separations with the MP5.

### **Auto Glass**

Auto Glass is the toughest and most difficult of all barrier tests. Federal HST experienced core jacket separations with 9mm 124 gr. and 45 Auto 230 gr. rounds, while the 9mm 147 gr. HST performed flawlessly. All HST rounds had good penetration.

**Winchester experienced core jacket separations with *all rounds*.**

### **Review**

Consistency is a major component in the selection of high performance duty ammunition. Federal HST round performed consistently through all test media and firearm systems. HST only experienced core jacket separations in the Auto Glass event where the glass was not shot up (33% of HST bullets did not experience core jacket separation on Auto Glass). In all fairness to the scientific nature of the testing, Winchester's rounds were less consistent than HST as they experienced more than twenty (20+) Core Jacket Separations and inconsistent velocities.

## Core Jacket Separations

Experienced in September 6, 2002 Testing

	Federal			Winchester		
	P9HST1	P9HST2	P45HST1	RA9TA	RA9TP	RA45P
<b>Bare Gelatin</b>						
Glock 17	0	0		1	Unknown	
MP5	0	0		3	Unknown	
Glock 21			0			0
<b>Heavy Clothing</b>						
Glock 17	0	0		0	0	
MP5	0	0		2	2	
Glock 21			0			0
<b>Wall Board</b>						
Glock 17	0	0		0	0	
MP5	0	0		2	0	
Glock 21			0			0
<b>Glass</b>						
Glock 17	3	0		3	2	
MP5	3	0		3	Unknown	
Glock 21			2			2
<b>Total</b>	<b>6</b>	<b>0</b>	<b>2</b>	<b>14</b>	<b>4</b>	<b>2</b>

\*It is important to note that Federal HST had no core jacket separations on bare gelatin, heavy clothing, and wallboard and only a percentage of the rounds separated on glass shots, while the Winchester rounds experienced core jacket separations on bare gelatin, heavy clothing, wall board, and glass.

The topics of the day were FBI Test Protocol, Penetration, Expansion, and **Core Jacket Separations**. According to wound ballistic experts, Core Jacket Separations are the number one cause for bullet failure.

### ***IWBA Handgun Ammunition Specification – Duncan MacPherson***

*“6.1.3 The goal is to avoid all bullet fragmentation and/or jacket separation. This requirement is that the largest bullet segment weight shall be at least 90% of the mean unfired bullet weight in at least 90% of penetrations.” (Duncan MacPherson, IWBA Vol 3, No. 3 pg 23). “This specification is included to prevent unsound bullet designs that over expand and break up (which reduces effectiveness in handgun bullets) or bullet designs that tend to separate the jacket early in the penetration. Some bullet designs occasionally shed their jackets near the end of penetration; this is not desirable” (Duncan MacPherson, IWBA Vol 3, No. 3, Page 26).*

Core Jacket Separations are typically identified as failures as the separated jackets often get hung up in clothing and result in less that favorable penetration. In accordance with the FBI test protocol, when measuring core jacket separations only the largest portion of the bullet is weighed and measured. ***Bullets that maintain their jacket are also preferred as the rifling on the jacket assures microscopic traceability to specific firearms.***





## Wound Ballistic Workshop

Date: September 6, 2002  
 Host Agency: Portland Police Bureau  
 Agency Contact: Scott Elliott  
 Telephone: \_\_\_\_\_  
 Range Master: \_\_\_\_\_

Recorder: Brandon Graves  
 Statistician: Brandon Graves  
 Shooter: \_\_\_\_\_  
 Judge: Scott Elliott  
 Agencies Attending: Portland Police Bureau  
 Agency Personnel: 5

Type of Range: Indoor  
 Chronograph: CED Millenium  
 Temperature: \_\_\_\_\_  
 Weather: NA  
 Rep: Brandon Graves - Federal Cartridge  
Rob Huson - J Harding Associates  
Paul LeFevour - SDPEC  
Steve McGrory - SDPEC

Shot #	Test Event	Weapon	Ammo Mfg	Ammo Type	Part Number	Lot Number	Caliber	Bullet Weight (Grains)	Velocity (Ft./Sec.)	Penetration (Inches)	Expanded Bullet Diameter	Retained Weight (Grains)	% Weight Retention	Comments
1	1		Daisy	BB			0.177		593	3.75				39.3 Degrees F
2	1	Glock 17	Federal	HST	P9HST1	24T234	9MM	124	1182	12.00	0.697	126.0	101.61%	
3	1	Glock 17	Federal	HST	P9HST1	24T234	9MM	124	1153	12.25	0.706	125.4	101.13%	
4	1	Glock 17	Federal	HST	P9HST1	24T234	9MM	124	1163	12.50	0.692	124.6	100.48%	
5	1	MP5	Federal	HST	P9HST1	24T234	9MM	124	1281	13.25	0.55	92.8	74.84%	
6	1	MP5	Federal	HST	P9HST1	24T234	9MM	124	1313	13.50	0.555	92.6	74.68%	
7	1	MP5	Federal	HST	P9HST1	24T234	9MM	124	1292	11.75	0.589	112.1	90.40%	
8	1		Daisy	BB					597	3.75				
9	2	Glock 17	Federal	HST	P9HST1	24T234	9MM	124	1153	14.00	0.62	124.5	100.40%	
10	2	Glock 17	Federal	HST	P9HST1	24T234	9MM	124	1165	14.00	0.62	124.3	100.24%	
11	2	Glock 17	Federal	HST	P9HST1	24T234	9MM	124	1159	15.50	0.607	124.3	100.24%	
12	2	MP5	Federal	HST	P9HST1	24T234	9MM	124	1312	13.00	0.659	124.1	100.08%	
13	2	MP5	Federal	HST	P9HST1	24T234	9MM	124	1283	13.50	0.653	101.4	81.77%	
14	2	MP5	Federal	HST	P9HST1	24T234	9MM	124	1264	13.75	0.636	124.3	100.24%	Exited Side of Block

#1	Bare Gelatin @ 10 Feet	#3	Steel @ 10 Feet	#5	Plywood @ 10 Feet	#7	Heavy Clothing @ 20 Yards
#2	Heavy Clothing @ 10 Feet	#4	Wallboard @ 10 Feet	#6	Auto Glass @ 10 Feet	#8	Auto Glass @ 20 Yards

Shot #	Test Event	Weapon	Ammo Mfg	Ammo Type	Part Number	Lot Number	Caliber	Bullet Weight (Grains)	Velocity (Ft./Sec.)	Penetration (Inches)	Expansion (Inches)	Retained Weight (Grains)	% Weight Retention	Comments
15	1	Daisy	Daisy	BB			0.177		594	3.25				Gelatin Calibration
16	4	Glock 17	Federal	HST	P9HST1	24T234	9MM	124	1174	13.25	0.595	124.3	100.24%	
17	4	Glock 17	Federal	HST	P9HST1	24T234	9MM	124	1170	12.50	0.589	121.7	98.15%	
18	4	Glock 17	Federal	HST	P9HST1	24T234	9MM	124	1160	12.00	0.617	124.6	100.48%	
19	4	MP5	Federal	HST	P9HST1	24T234	9MM	124	1267	12.00	0.634		0.00%	BLR
20	4	MP5	Federal	HST	P9HST1	24T234	9MM	124	1290	NA			0.00%	Exited Side of Block
21	4	MP5	Federal	HST	P9HST1	24T234	9MM	124	1294	11.50	0.639		0.00%	
22	4	MP5	Federal	HST	P9HST1	24T234	9MM	124	1294	10.75			0.00%	
23	1	Daisy		BB				0.177	590	3.75			0.00%	39.9
24	6	Glock 17	Federal	HST	P9HST1	24T234	9MM	124	1171	13.00	0.449	77.1	62.18%	Core Jacket Separation 1"
25	6	Glock 17	Federal	HST	P9HST1	24T234	9MM	124	1162	13.75	0.422	74.6	60.16%	Core Jacket Separation 2"
26	6	Glock 17	Federal	HST	P9HST1	24T234	9MM	124	1176	12.00	0.455	79.3	63.95%	Core Jacket Separation 11.75"
27	6	MP5	Federal	HST	P9HST1	24T234	9MM	124	1291	9.75	0.471	72.1	58.15%	Core Jacket Separation 2"
28	6	MP5	Federal	HST	P9HST1	24T234	9MM	124	1288	12.00	0.466	77.1	62.18%	Core Jacket Separation
29	6	MP5	Federal	HST	P9HST1	24T234	9MM	124	1309	13.75	0.438	75.1	60.56%	Core Jacket Separation
30	1		Daisy					0.177	575	3.75			0.00%	39.9
31	1	Glock 17	Federal	HST	P9HST2	22N028	9MM	147	983	15.00	0.66	148.5	101.02%	
32	1	Glock 17	Federal	HST	P9HST2	22N028	9MM	147	991	14.00	0.641	149.2	101.50%	
33	1	MP5	Federal	HST	P9HST2	22N028	9MM	147	1058	14.75	0.659	149.1	101.43%	
34	1	MP5	Federal	HST	P9HST2	22N028	9MM	147	1095	13.25	0.694	135.5	92.18%	
35	1	Glock 21	Federal	HST	P45HST1	32N136	45 Auto	230	602		0.876	231.0	100.43%	Exited Side of Block

#1	Bare Gelatin @ 10 Feet	#3	Steel @ 10 Feet	#5	Plywood @ 10 Feet	#7	Heavy Clothing @ 20 Yards
#2	Heavy Clothing @ 10 Feet	#4	Wallboard @ 10 Feet	#6	Auto Glass @ 10 Feet	#8	Auto Glass @ 20 Yards

Shot #	Test Event	Weapon	Ammo Mfg	Ammo Type	Part Number	Lot Number	Caliber	Bullet Weight (Grains)	Velocity (Ft./Sec.)	Penetration (Inches)	Expansion (Inches)	Retained Weight (Grains)	% Weight Retention	Comments
36	1	Glock 21	Federal	HST	P45HST1	32N136	45 Auto	230	681				0.00%	Exited Block
37	1	Glock 21	Federal	HST	P45HST1	32N136	45 Auto	230	651	14.00	0.902	230.7	100.30%	
38	1		Daisy				0.177		585	3.00				41.3
39	1	Glock 21	Federal	HST	P45HST1	32N136	45 Auto	230	649	15.00	0.889	230.0	100.00%	
40	2	Glock 17	Federal	HST	P9HST2	22N028	9MM	147	992	16.00	0.595	147.8	100.54%	
41	2	Glock 17	Federal	HST	P9HST2	22N028	9MM	147	997	16.00	0.601	147.9	100.61%	
42	2	Glock 21	Federal	HST	P45HST1	32N136	45 Auto	230	607	15.25	0.846	230.3	100.13%	
43	2	Glock 21	Federal	HST	P45HST1	32N136	45 Auto	230	671	14.50	0.834	230.3	100.13%	
44	2	MP5	Federal	HST	P9HST2	22N028	9MM	147	1071	16.00	0.595	148.9	101.29%	
45	2	MP5	Federal	HST	P9HST2	22N028	9MM	147	1094	14.25	0.675	148.3	100.88%	
46	4	Glock 17	Federal	HST	P9HST2	22N028	9MM	147	975		0.601	150.4	102.31%	
47	4	Glock 17	Federal	HST	P9HST2	22N028	9MM	147	988				0.00%	Exited Block
48			Daisy				0.177		596	3.25				38.1
49	4	Glock 17	Federal	HST	P9HST2	22N028	9MM	147	979	14.00	0.597	147.6	100.41%	
50	4	Glock 21	Federal	HST	P45HST1	32N136	45 Auto	230	641				0.00%	Exit
51	4	Glock 21	Federal	HST	P45HST1	32N136	45 Auto	230	670	13.50	0.821	230.6	100.26%	
52	4	Glock 21	Federal	HST	P45HST1	32N136	45 Auto	230	653			231.3	100.57%	
53	4	MP5	Federal	HST	P9HST2	22N028	9MM	147	1057				0.00%	
54	4	MP5	Federal	HST	P9HST2	22N028	9MM	147	1075				0.00%	
55														

#1	Bare Gelatin @ 10 Feet		#3	Steel @ 10 Feet		#5	Plywood @ 10 Feet		#7	Heavy Clothing @ 20 Yards
#2	Heavy Clothing @ 10 Feet		#4	Wallboard @ 10 Feet		#6	Auto Glass @ 10 Feet		#8	Auto Glass @ 20 Yards



## Winchester Data

Shot #	Test. Event	Weapon	Mfg	Part #	Caliber	Weight	Velocity	Penetration	Bullet Diam. (lg)	Bullet Diam. (sm)	Retained Weight	Comments
1	1	G17	Win	RA9TA	9mm	127+p+	1277	13	0.67	0.62	77.6	Core Jacket Separation
2	1	G17	Win	RA9TA	9mm	127+p+	1232	11.5	0.64	0.61	115.7	
3	1	G17	Win	RA9TA	9mm	127+p+	1281	13.25	.440*	0.424	115.3	Core Jacket Separation
4	1	MP5	Win	RA9TA	9mm	127+p+	1371	13.25	0.475	0.445	71.4	Core Jacket Separation
5	1	MP5	Win	RA9TA	9mm	127+p+	1378	13.25	0.449	0.434	78	Core Jacket Separation
6	1	MP5	Win	RA9TA	9mm	127+p+	1372	14.5	0.446	0.424	77.9	Core Jacket Separation
7	2	G17	Win	RA9TA	9mm	127+p+	1269	11.75	0.75	0.72	122.1	
8	2	G17	Win	RA9TA	9mm	127+p+	1274	11.25	0.75	0.688	121.9	
9	2	G17	Win	RA9TA	9mm	127+p+	1268	11.75	0.68	0.65	121	
10	2	MP5	Win	RA9TA	9mm	127+p+	1378	12.75	0.644	0.643	121.7	
11	2	MP5	Win	RA9TA	9mm	127+p+	1361	11.75	0.787	0.601	117.7	Core Jacket Separation
12	2	MP5	Win	RA9TA	9mm	127+p+	1364	11.00 *	0.674	0.63	115.6	Core Jacket Separation
13	4	G17	Win	RA9TA	9mm	127+p+	1281					Reshoot, same channel
14	4	G17	Win	RA9TA	9mm	127+p+	1267	11	0.675	0.555	123.3	
15	4	G17	Win	RA9TA	9mm	127+p+	1267	11.25	0.685	0.596	124.2	
16	4	G17	Win	RA9TA	9mm	127+p+	1261	12	0.74	0.691	125.2	
17	4	MP5	Win	RA9TA	9mm	127+p+	1372	11.5	0.804	0.626	123.4	
18	4	MP5	Win	RA9TA	9mm	127+p+	1367	13.25	0.477	0.47	85.1	Core Jacket Separation
19	4	MP5	Win	RA9TA	9mm	127+p+	1374	12.25	0.556	0.523	84.5	Core Jacket Separation
20	6	G17	Win	RA9TA	9mm	127+p+	1277	9.75	0.574	0.378	79.4	Core Jacket Separation
21	6	G17	Win	RA9TA	9mm	127+p+	1264	10.25	0.47	0.422	78.9	Core Jacket Separation
22	6	G17	Win	RA9TA	9mm	127+p+	1266	11.25	0.495	0.441	79.4	Core Jacket Separation
23	6	MP5	Win	RA9TA	9mm	127+p+	1351	10.5	0.598		77.8	Core Jacket Separation
24	6	MP5	Win	RA9TA	9mm	127+p+	1372	8	603		81.3	Core Jacket Separation
25	6	MP5	Win	RA9TA	9mm	127+p+	1370	9.5	0.702		80.5	Core Jacket Separation
26	2	G21	Win	RA45P	45	230	978	11.75	0.812	0.78	231.2	
27	2	G21	Win	RA45P	45	230	903	12	0.811	0.735	239.9	
28	2	G17	Win	RA9TP	9mm	147	966	12.5	0.676		143.6	Win block 604 vel. / 41.3 degrees F
29	2	G17	Win	RA9TP	9mm	147	981	14	0.648	0.639	144.4	
30	2	MP5	Win	RA9TP	9mm	147	1052	13	?	?	?	Core Jacket Separation
31	2	MP5	Win	RA9TP	9mm	147	1095	16.25	0.504	0.489	115.9	Core Jacket Separation
32	4	G17	Win	RA9TP	9mm	147	964	11	0.639	0.622	142.3	
33	4	G17	Win	RA9TP	9mm	147	955	11	0.662	0.641	146	

Shot #	Test. Event	Weapon	Mfg	Part #	Caliber	Weight	Velocity	Penetration	Bullet Diam. (lg)	Bullet Diam. (sm)	Retained Weight	Comments
34	4	G21	Win	RA45P	45	230	898	11.25	0.804	0.791	230	
35	4	G21	Win	RA45P	45	230	912	10.75	0.835	0.826	229.8	
36	4	MP5	Win	RA9TP	9mm	147	1047	12.5	0.685	0.628	139.1	
37	4	MP5	Win	RA9TP	9mm	147	1073	12.75	0.761	0.552	139.9	
38	6	G17	Win	RA9TP	9mm	147	971	12	0.612	0.429	111.3	Core Jacket Separation
39	6	G17	Win	RA9TP	9mm	147	960	13	0.559	0.443	114	Core Jacket Separation
40	6	G21	Win	RA45P	45	230	923	12	0.879	0.673	182.6	Core Jacket Separation
41	6	G21	Win	RA45P	45	230	915	13.5	0.671	0.583	187.9	Core Jacket Separation