Effects of Pressure Variations on Identifying "Hits" through NIBIN: Initial Research

By

Richard Pumerantz, PhD, Ten-X Ammunition, Inc. &

Matt Noedel, Noedel Scientific

With assistance from: Andrew Van Lahr, Ten-X Ammunition, Inc. Anya Sanko, Las Vegas Metropolitan Police Department

The purpose of this study is to determine differences in toolmarks due to the variations in pressures resulting from differences in powder charges, and the ability of the NIBIN system to identify these differences when fired from a test firearm.

Loading Protocols

45 ACP Production Specifications:

Brass was new from Starline Brass Company.

Bullets were Armscorp 230gr brass jacket, lead core, Full Metal Jacket (FMJ).

Primers were standard Winchester Large Pistol (WLP) lot no. CKL515G.

Cartridges were loaded to 1.264" Overall Length (OAL) which is within the tolerance dimensions of M1911 Ball ammunition. (1.256-1.266")

Production Equipment:

Dillon 550 loading press with three RCBS loading dies were used to expand/bell the casing, seating the bullet and crimping.

RCBS Automatic Bench Priming tool with a Lee Precision #2 shell holder was used for priming each case

RCBS 505 reloading scale was used.

RCBS Powder Trickler – used for getting exact powder weight into scale

Loading Procedure:

The brass was first primed using the RCBS Automatic Bench Priming Tool using the Lee Precision #2 shell holder. The priming system of the Dillon 550 press was removed. Each casing was then belled to accept a bullet.

Each charge was individually weighed and the operation was repeated. Cases were charged 10 at a time, and then a visual inspection was made of the charges. After the visual inspection, a bullet was placed in each case mouth and the press was cycled to seat the bullet, then crimped. Each round was checked with a Dillon 45 ACP Case Gauge and bagged in the proper coded bag.

This process was repeated a total of ten times yielding a total of one-hundred rounds.

Lot Identification

		Powder Wt		Bullet Wt	Overall Length		Velocity 1	Velocity 2	Velocity 3	Velocity 4	Velocity 5	Average Velocity	Standard
Lot Code	Powder Type	(grains)	Primer	(grains)	(inches)	Caliber	(fps)	(fps)	(fps)	(fps)	(fps)	(fps)	Deviation
А	Clays	4.0	WLP	230	1.264	.45 ACP	717	723	712	719	718	718	3.96
В	Clays	3.7	WLP	230	1.264	.45 ACP	631	663	663	675	663	659	16.49
с	HP-38	5.3	WLP	230	1.264	.45 ACP	689	709	716	708	740	712	18.39
D	HP-38	4.2	WLP	230	1.264	.45 ACP	532	517	537	542	error	532	10.80
E	HS-6	8.2	WLP	230	1.264	.45 ACP	784	799	804	828	816	806	16.74
F	HS-6	8.0	WLP	230	1.264	.45 ACP	763	794	792	810	809	794	19.01
G	700-X	4.9	WLP	230	1.264	.45 ACP	813	829	817	842	830	826	11.52
н	700-X	4.4	WLP	230	1.264	.45 ACP	709	747	743	744	761	741	19.19
I	Universal	5.6	WLP	230	1.264	.45 ACP	720	755	709	743	723	730	18.60
J	Universal	5.1	WLP	230	1.264	.45 ACP	559	605	633	615	656	614	36.16

Breech Face Correlation - LVMPD and SoCal

Powder	379 Hits Returned	Rank 2	Rank 4	Rank 13	Rank 14	Rank 18	Rank 19	Rank 29	Rank 98	Rank 155	l
Clays	Lot Code A	Lot Code H	Lot Code F	Lot Code G	Lot Code D	Lot Code E	Lot Code C	Lot Code I	Lot Code J	Lot Code B	l
718	A - B = Rank 155	741	794	826	532	806	712	730	614	659	l
		-		<u> </u>					<u> </u>		
Powder	385 Hits Returned	Rank 1	Rank 2	Rank 3	Rank 4	Rank 19	Rank 20	Rank 90	Rank 181	Rank 214	l
Clavs	Lot Code B	Lot Code C	Lot Code F	Lot Code F	Lot Code G	Lot Code I	Lot Code H	Lot Code D	Lot Code A	Lot Code J	l
659	B - A = Rank 181	712	794	806	826	730	741	532	718	614	l
000	B A-Runk IOI	, 12	734	000	020	/30	/11	552	/10	014	
Powder	474 Hits Returned	Bank 1	Bank 2	Rank 3	Bank 4	Rank 5	Rank 22	Rank 36	Rank 45	Rank 125	l
HP-38		Lot Code B	Lot Code E	Lot Code G		Lot Code F	Lot Code A	Lot Code H	Lot Code D	Lot Code L	l
712	C = D = Pank 45	659	794	826	730	806	718	741	532	614	l
/12	$C = D = \operatorname{Rank} + 3$	035	734	820	/30	800	/10	/41	552	014	
Powder	395 Hits Returned	Rank 17	Rank 18	Rank 19	Rank 22	Bank 23	Bank 24	Rank 27	Rank 46	Rank 97	l
HP-38	Lot Code D	Lot Code G	Lot Code J	Lot Code H	Lot Code I	Lot Code F	Lot Code A	Lot Code F	Lot Code C	Lot Code B	l
532	D - C = Bank 46	826	614	741	730	794	718	806	712	659	l
552		020		7.12		731	,10	000	/12		
Powder	391 Hits Returned	Bank 1	Bank 2	Rank 3	Bank 4	Rank 8	Rank 11	Rank 19	Rank 20		
HS-6	Lot Code E**	Lot Code F	Lot Code G	Lot Code B	Lot Code C	Lot Code H	Lot Code I	Lot Code D	Lot Code A		
806	E - E = Rank 1	794	826	659	712	741	730	532	718	**Lot Code E did	not hit on Lot Code J
		1 ,3.			,12	/ //2	,50	552	,10	, any mere in the	
Powder	382 Hits Returned	Rank 1	Bank 2	Rank 3	Bank 4	Rank 5	Bank 7	Rank 9	Rank 21	Rank 33	l
HS-6	Lot Code F	Lot Code F	Lot Code C	Lot Code B	Lot Code H	Lot Code G	Lot Code I	Lot Code A	Lot Code D	Lot Code J	l
794	F - F = Rank 1	806	712	659	741	826	730	718	532	614	l
754			,12	055	/41	020	/30	710	332	014	
		1	1	· · · · · · · · · · · · · · · · · · ·	1						1
Powder					ļ						1
	375 Hits Returned	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5	Rank 7	Rank 12	Rank 15	Rank 206	
700-X	375 Hits Returned	Rank 1	Rank 2 Lot Code F	Rank 3	Rank 4 Lot Code H	Rank 5	Rank 7 Lot Code B	Rank 12 Lot Code D	Rank 15 Lot Code A	Rank 206 Lot Code J	
700-X 826	375 Hits Returned Lot Code G G - H = Rank 4	Rank 1 Lot Code E 806	Rank 2 Lot Code F 794	Rank 3 Lot Code I 730	Rank 4 Lot Code H 741	Rank 5 Lot Code C 712	Rank 7 Lot Code B 659	Rank 12 Lot Code D 532	Rank 15 Lot Code A 718	Rank 206 Lot Code J 614	
700-X 826	375 Hits Returned Lot Code G G - H = Rank 4	Rank 1 Lot Code E 806	Rank 2 Lot Code F 794	Rank 3 Lot Code I 730	Rank 4 Lot Code H 741	Rank 5 Lot Code C 712	Rank 7 Lot Code B 659	Rank 12 Lot Code D 532	Rank 15 Lot Code A 718	Rank 206 Lot Code J 614	
700-X 826 Powder	375 Hits Returned Lot Code G G - H = Rank 4 410 Hits Returned	Rank 1 Lot Code E 806 Rank 1	Rank 2 Lot Code F 794 Rank 2	Rank 3	Rank 4 Lot Code H 741 Rank 8	Rank 5 Lot Code C 712 Rank 9	Rank 7 Lot Code B 659 Rank 12	Rank 12 Lot Code D 532 Rank 13	Rank 15 Lot Code A 718 Rank 14	Rank 206 Lot Code J 614 Rank 15	
700-X 826 Powder 700-X	375 Hits Returned Lot Code G G - H = Rank 4 410 Hits Returned Lot Code H	Rank 1 Lot Code E 806 Rank 1	Rank 2 Lot Code F 794 Rank 2	Rank 3 Lot Code I 730 Rank 3	Rank 4 Lot Code H 741 Rank 8	Rank 5 Lot Code C 712 Rank 9	Rank 7 Lot Code B 659 Rank 12	Rank 12 Lot Code D 532 Rank 13	Rank 15 Lot Code A 718 Rank 14	Rank 206 Lot Code J 614 Rank 15	
700-X 826 Powder 700-X 741	375 Hits Returned Lot Code G G - H = Rank 4 410 Hits Returned Lot Code H H - G = Rank 2	Rank 1 Lot Code E 806 Rank 1 Lot Code F 794	Rank 2 Lot Code F 794 Rank 2 Lot Code G 826	Rank 3 Lot Code I 730 Rank 3 Lot Code A 718	Rank 4 Lot Code H 741 Rank 8 Lot Code E 806	Rank 5 Lot Code C 712 Rank 9 Lot Code 1 730	Rank 7 Lot Code B 659 Rank 12 Lot Code D 532	Rank 12 Lot Code D 532 Rank 13 Lot Code B	Rank 15 Lot Code A 718 Rank 14 Lot Code J	Rank 206 Lot Code J 614 Rank 15 Lot Code C	
700-X 826 Powder 700-X 741	375 Hits Returned Lot Code G G - H = Rank 4 410 Hits Returned Lot Code H H - G = Rank 2	Rank 1 Lot Code E 806 Rank 1 Lot Code F 794	Rank 2 Lot Code F 794 Rank 2 Lot Code G 826	Rank 3 Lot Code I 730 Rank 3 Lot Code A 718	Rank 4 Lot Code H 741 Rank 8 Lot Code E 806	Rank 5 Lot Code C 712 Rank 9 Lot Code I 730	Rank 7 Lot Code B 659 Rank 12 Lot Code D 532	Rank 12 Lot Code D 532 Rank 13 Lot Code B 659	Rank 15 Lot Code A 718 Rank 14 Lot Code J 614	Rank 206 Lot Code J 614 Rank 15 Lot Code C 712	
700-X 826 Powder 700-X 741	375 Hits Returned Lot Code G G - H = Rank 4 410 Hits Returned Lot Code H H - G = Rank 2	Rank 1 Lot Code E 806 Rank 1 Lot Code F 794	Rank 2 Lot Code F 794 Rank 2 Lot Code G 826	Rank 3 Lot Code I 730 Rank 3 Lot Code A 718	Rank 4 Lot Code H 741 Rank 8 Lot Code E 806	Rank 5 Lot Code C 712 Rank 9 Lot Code 1 730	Rank 7 Lot Code B 659 Rank 12 Lot Code D 532	Rank 12 Lot Code D 532 Rank 13 Lot Code B 659	Rank 15 Lot Code A 718 Rank 14 Lot Code J 614	Rank 206 Lot Code J 614 Rank 15 Lot Code C 712	
700-X 826 Powder 700-X 741 Powder	375 Hits Returned Lot Code G G - H = Rank 4 410 Hits Returned Lot Code H H - G = Rank 2 402 Hits Returned	Rank 1 Lot Code E 806 Rank 1 Lot Code F 794 Rank 1	Rank 2 Lot Code F 794 Rank 2 Lot Code G 826 Rank 2	Rank 3 Lot Code I 730 Rank 3 Lot Code A 718 Rank 3	Rank 4 Lot Code H 741 Rank 8 Lot Code E 806 Rank 5	Rank 5 Lot Code C 712 Rank 9 Lot Code 1 730 Rank 8	Rank 7 Lot Code B 659 Rank 12 Lot Code D 532 Rank 13	Rank 12 Lot Code D 532 Rank 13 Lot Code B 659 Rank 16	Rank 15 Lot Code A 718 Rank 14 Lot Code J 614 Rank 20	Rank 206 Lot Code J 614 Rank 15 Lot Code C 712 Rank 34	
700-X 826 Powder 700-X 741 Powder Universal	375 Hits Returned Lot Code G G - H = Rank 4 410 Hits Returned Lot Code H H - G = Rank 2 402 Hits Returned Lot Code I	Rank 1 Lot Code E 806 Rank 1 Lot Code F 794 Rank 1 Lot Code G	Rank 2 Lot Code F 794 Rank 2 Lot Code G 826 Rank 2 Lot Code C	Rank 3 Lot Code I 730 Rank 3 Lot Code A 718 Rank 3 Lot Code F	Rank 4 Lot Code H 741 Rank 8 Lot Code E 806 Rank 5 Lot Code J	Rank 5 Lot Code C 712 Rank 9 Lot Code I 730 Rank 8 Lot Code H	Rank 7 Lot Code B 659 Rank 12 Lot Code D 532 Rank 13 Lot Code E	Rank 12 Lot Code D 532 Rank 13 Lot Code B 659 Rank 16 Lot Code D	Rank 15 Lot Code A 718 Rank 14 Lot Code J 614 Rank 20 Lot Code B	Rank 206 Lot Code J 614 Rank 15 Lot Code C 712 Rank 34 Lot Code A	
700-X826Powder700-X741PowderUniversal730	375 Hits Returned Lot Code G G - H = Rank 4 410 Hits Returned Lot Code H H - G = Rank 2 402 Hits Returned Lot Code I I - J = Rank 5	Rank 1 Lot Code E 806 Rank 1 Lot Code F 794 Rank 1 Lot Code G 826	Rank 2 Lot Code F 794 Rank 2 Lot Code G 826 Rank 2 Lot Code C 712	Rank 3 Lot Code I 730 Rank 3 Lot Code A 718 Rank 3 Lot Code F 794	Rank 4 Lot Code H 741 Rank 8 Lot Code E 806 Rank 5 Lot Code J 614	Rank 5 Lot Code C 712 Rank 9 Lot Code I 730 Rank 8 Lot Code H 741	Rank 7 Lot Code B 659 Rank 12 Lot Code D 532 Rank 13 Lot Code E 806	Rank 12 Lot Code D 532 Rank 13 Lot Code B 659 Rank 16 Lot Code D 532	Rank 15 Lot Code A 718 Rank 14 Lot Code J 614 Rank 20 Lot Code B 659	Rank 206 Lot Code J 614 Rank 15 Lot Code C 712 Rank 34 Lot Code A 718	
700-X 826 Powder 700-X 741 Powder Universal 730	375 Hits Returned Lot Code G G - H = Rank 4 410 Hits Returned Lot Code H H - G = Rank 2 402 Hits Returned Lot Code I I - J = Rank 5	Rank 1 Lot Code E 806 Rank 1 Lot Code F 794 Rank 1 Lot Code G 826	Rank 2 Lot Code F 794 Rank 2 Lot Code G 826 Rank 2 Lot Code C 712	Rank 3 Lot Code I 730 Rank 3 Lot Code A 718 Rank 3 Lot Code F 794	Rank 4 Lot Code H 741 Rank 8 Lot Code E 806 Rank 5 Lot Code J 614	Rank 5 Lot Code C 712 Rank 9 Lot Code I 730 Rank 8 Lot Code H 741	Rank 7 Lot Code B 659 Rank 12 Lot Code D 532 Rank 13 Lot Code E 806	Rank 12 Lot Code D 532 Rank 13 Lot Code B 659 Rank 16 Lot Code D 532	Rank 15 Lot Code A 718 Rank 14 Lot Code J 614 Rank 20 Lot Code B 659	Rank 206 Lot Code J 614 Rank 15 Lot Code C 712 Rank 34 Lot Code A 718	
700-X 826 Powder 700-X 741 Powder Universal 730	375 Hits Returned Lot Code G G - H = Rank 4 410 Hits Returned Lot Code H H - G = Rank 2 402 Hits Returned Lot Code I I - J = Rank 5 403 Hits Returned	Rank 1 Lot Code E 806 Rank 1 Lot Code F 794 Rank 1 Lot Code G 826 Rank 3	Rank 2 Lot Code F 794 Rank 2 Lot Code G 826 Rank 2 Lot Code C 712 Rank 14	Rank 3 Lot Code I 730 Rank 3 Lot Code A 718 Rank 3 Lot Code F 794 Rank 42	Rank 4 Lot Code H 741 Rank 8 Lot Code E 806 Rank 5 Lot Code J 614 Rank 43	Rank 5 Lot Code C 712 Rank 9 Lot Code 1 730 Rank 8 Lot Code H 741 741	Rank 7 Lot Code B 659 Rank 12 Lot Code D 532 Rank 13 Lot Code E 806 Rank 159	Rank 12 Lot Code D 532 Rank 13 Lot Code B 659 Rank 16 Lot Code D 532 Rank 215	Rank 15 Lot Code A 718 Rank 14 Lot Code J 614 Rank 20 Lot Code B 659 Rank 225	Rank 206 Lot Code J 614 Rank 15 Lot Code C 712 Rank 34 Lot Code A 718 Rank 233	

J - I = Rank 3

Firing Pin Correlation - LVMPD and SoCal

		1	1						1		
Powder	379 Hits Returned	Rank 1	Rank 2	Rank 3	Rank 13	Rank 14	Rank 23	Rank 51	Rank 96	Rank 154	
Clays	Lot Code A	Lot Code B	Lot Code I	Lot Code G	Lot Code C	Lot Code D	Lot Code J	Lot Code F	Lot Code E	Lot Code H	
718	A - B = Rank 1	659	730	826	712	532	614	794	806	741	
Powder	385 Hits Returned	Rank 1	Rank 5	Rank 9	Rank 10	Rank 14	Rank 57	Rank 99	Rank 139	Rank 235	
Clays	Lot Code B	Lot Code A	Lot Code G	Lot Code J	Lot Code F	Lot Code I	Lot Code D	Lot Code C	Lot Code H	Lot Code E	
659	B - A = Rank 1	718	826	614	794	730	532	712	741	806	
	•					•					
Powder	424 Hits Returned	Rank 1	Rank 2	Rank 14	Rank 20	Rank 100	Rank 175	Rank 219	Rank 248	Rank 262	
HP-38	Lot Code C	Lot Code D	Lot Code E	Lot Code G	Lot Code A	Lot Code B	Lot Code I	Lot Code J	Lot Code F	Lot Code H	
712	C - D = Rank 1	532	806	826	718	659	730	614	794	741	
										1	
Powder	395 Hits Returned	Rank 1	Rank 17	Rank 33	Rank 54	Rank 55	Rank 104	Rank 140	Bank 220	Rank 221	
HP-38	Lot Code D	Lot Code C	Lot Code A	Lot Code I	Lot Code G	Lot Code B	Lot Code H	Lot Code F	Lot Code J	Lot Code F	
532	D = C = Bank 1	712	718	730	826	659	741	794	614	806	
552	D C - Ruik I	/12	/10	, , , , , , , , , , , , , , , , , , , ,	020		/ 11	734	014	000	
Bowder	201 Lite Poturnod	Pank 1	Pank 45	Pank 66	Pank 122	Pank 134	Papk 151	Papk 224	Bank 284		
	Lot Code 5**	Lot Code C		Lot Codo G	Lot Code L	Lot Code D	Lot Code R	Lot Code E			
H3-0		Lot code c	Lot code A		Lot code i	Lot code D	LOI COUE B	Lot code F		-	
806	F - F = Bank 224	712	718	826	730	532	659	794	741	**Lot Code E did no anywhere in the 3	ot hit on Lot Code J 391 hits returned
Powder	382 Hits Returned	Rank 1	Rank 6	Rank 7	Rank 14	Rank 22	Rank 26	Rank 82	Rank 237	Rank 238	
HS-6	Lot Code F	Lot Code B	Lot Code H	Lot Code G	Lot Code I	Lot Code J	Lot Code A	Lot Code D	Lot Code F	Lot Code C	
794	E - E = Bank 237	659	741	826	730	614	718	532	806	712	
Powder	375 Hits Returned	Bank 2	Rank 3	Bank 5	Rank 8	Bank 9	Rank 11	Rank 33	Bank 102	Rank 219	
700-X	Lot Code G	Lot Code B	Lot Code A	Lot Code L	Lot Code C	Lot Code L	Lot Code E	Lot Code D	Lot Code F	Lot Code H	
826	G - H = Bank 219	659	718	614	712	730	794	532	806	741	
020		035	/10	014	/12	/30	,,,,	552		741	I
Bowder	410 Hits Returned	Pank 32	Pank 134	Pank 149	Pank 174	Pank 187	Rank 221	Pank 232	Rank 263	Rank 320	
700 X		Lot Codo E	Lot Code L	Lot Code D	Lot Code P	Lot Code A	Lot Code L		Lot Code C	Lot Code E	
700-X		704	720	522		210	Lot code J		240		
/41	n - G = Kalik 255	794	/30	532	059	/18	014	820	/12	808	
Downlar	402 Lite Deturned	Pank 1	Pank 2	Pank 2	Dank C	Park 10	Park 27	Paper 42	Park OC	Papir 131	
Powder	402 Hits Returned	Kdiik 1	KdIIK 2	Kdlik S		RdIIK 10	Kdlik 27	Kdlik 45	Kalik 90	Kdlik 151	
Universal		Lot Code A	Lot Code B	Lot Cde G	Lot Code F	Lot Code D	Lot Code J	Lot Code H		Lot Code E	
730	I - J = Rank 27	718	659	826	794	532	614	741	712	806	
Powder	403 Hits Returned	Rank 1	Rank 3	Rank 7	Rank 14	Rank 19	Rank 119	Rank 137	Rank 166	Rank 185	
Universal	Lot Code J	Lot Code B	Lot Code G	Lot Code A	Lot Code F	Lot Code I	Lot Code D	Lot Code H	Lot Code C	Lot Code E	
614	J - I = Rank 19	659	826	718	794	730	532	741	712	806	

Breech Face Correlation - LVMPD only

											_
Powder	34 Hits Returned	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5	Rank 6	Rank 8	Rank 13	Rank 16	
Clays	Lot Code A	Lot Code H	Lot Code F	Lot Code G	Lot Code D	Lot Code E	Lot Code C	Lot Code I	Lot Code J	Lot Code B	
718	A - B = Rank 16	741	794	826	532	806	712	730	614	659	
Powder	33 Hits Returned	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5	Rank 6	Rank 10	Rank 16	Rank 19	
Clays	Lot Code B	Lot Code C	Lot Code F	Lot Code E	Lot Code G	Lot Code I	Lot Code H	Lot Code D	Lot Code A	Lot Code J	
659	B - A = Rank 16	712	794	806	826	730	741	532	718	614	
									•		
Powder	33 Hits Returned	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5	Rank 6	Rank 8	Rank 9	Rank 12	
HP-38	Lot Code C	Lot Code B	Lot Code F	Lot Code G	Lot Code I	Lot Code E	Lot Code A	Lot Code H	Lot Code D	Lot Code J	
712	C - D = Rank 9	659	794	826	730	806	718	741	532	614	
Powder	35 Hits Returned	Rank 1	Rank 2	Rank 3	Rank 5	Rank 6	Rank 7	Rank 8	Rank 10	Rank 12	
HP-38	Lot Code D	Lot Code G	Lot Code J	Lot Code H	Lot Code I	Lot Code F	Lot Code A	Lot Code E	Lot Code C	Lot Code B	
532	D - C = Rank 10	826	614	741	730	794	718	806	712	659	
									•		
Powder	34 Hits Returned	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5	Rank 6	Rank 7	Rank 8		
HS-6	Lot Code E**	Lot Code F	Lot Code G	Lot Code B	Lot Code C	Lot Code H	Lot Code I	Lot Code D	Lot Code A		
										**I ot Code E did no	ot hit on Lot Code L
806	E - F = Rank 1	794	826	659	712	741	730	532	718	anywhere in the	34 hits returned
											1
Powder	33 Hits Returned	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5	Rank 6	Rank 7	Rank 8	Rank 9	
HS-6	Lot Code F	Lot Code E	Lot Code C	Lot Code B	Lot Code H	Lot Code G	Lot Code I	Lot Code A	Lot Code D	Lot Code J	-
794	F - E = Rank 1	806	712	659	741	826	730	718	532	614]
	İ.	1	1			1	1	1	1	1	1
Powder	33 Hits Returned	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5	Rank 6	Rank 7	Rank 8	Rank 15	
700-X	Lot Code G	Lot Code E	Lot Code F	Lot Code I	Lot Code H	Lot Code C	Lot Code B	Lot Code D	Lot Code A	Lot Code J	-
826	G - H = Rank 4	806	794	730	741	712	659	532	718	614	
									1		1
Powder	39 Hits Returned	Rank 1	Rank 2	Rank 3	Rank 5	Rank 6	Rank 7	Rank 8	Rank 9	Rank 10	
700-X	Lot Code H	Lot Code F	Lot Code G	Lot Code A	Lot Code E	Lot Code I	Lot Code D	Lot Code B	Lot Code J	Lot Code C	-
741	H - G = Rank 2	794	826	718	806	730	532	659	614	712	
		1						1			
Powder	33 Hits Returned	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5	Rank 6	Rank 7	Rank 8	Rank 10	
Universal	Lot Code I	Lot Code G	Lot Code C	Lot Code F	Lot Code J	Lot Code H	Lot Code E	Lot Code D	Lot Code B	Lot Code A	
730	I - J = Rank 4	826	712	794	614	741	806	532	659	718	
		1	1								1
Powder	37 Hits Returned	Rank 1	Rank 2	Rank 4	Rank 5	Rank 9	Rank 10	Rank 13	Rank 14	Rank 16	

J - I = Rank 1

Firing Pin Correlation - LVMPD only

Powder	34 Hits Returned	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5	Rank 6	Rank 8	Rank 13	Rank 16
Clavs	Lot Code A	Lot Code H	Lot Code F	Lot Code G	Lot Code D	Lot Code E	Lot Code C	Lot Code I	Lot Code J	Lot Code B
718	A - B = Rank 16	741	794	826	532	806	712	730	614	659
Powder	33 Hits Returned	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5	Rank 6	Rank 10	Rank 16	Rank 19
Clays	Lot Code B	Lot Code C	Lot Code F	Lot Code E	Lot Code G	Lot Code I	Lot Code H	Lot Code D	Lot Code A	Lot Code J
659	B - A = Rank 16	712	794	806	826	730	741	532	718	614
		•	•					•		
Powder	33 Hits Returned	Rank 1	Rank 2	Rank 3	Rank 4	Rank 7	Rank 11	Rank 17	Rank 19	Rank 24
HP-38	Lot Code C	Lot Code D	Lot Code E	Lot Code G	Lot Code A	Lot Code B	Lot Code I	Lot Code J	Lot Code F	Lot Code H
712	C - D = Rank 1	532	806	826	718	659	730	614	794	741
Powder	35 Hits Returned	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5	Rank 9	Rank 13	Rank 16	Rank 17
HP-38	Lot Code D	Lot Code C	Lot Code A	Lot Code I	Lot Code G	Lot Code B	Lot Code H	Lot Code F	Lot Code J	Lot Code E
532	D - C = Rank 1	712	718	730	826	659	741	794	614	806
						_				_
Powder	34 Hits Returned	Rank 1	Rank 4	Rank 5	Rank 10	Rank 11	Rank 12	Rank 17	Rank 26	
HS-6	Lot Code E**	Lot Code C	Lot Code A	Lot Code G	Lot Code I	Lot Code D	Lot Code B	Lot Code F	Lot Code H	
										**Lot Code F did not hit on
806	E - F = Rank 17	712	718	826	730	532	659	794	741	anywhere in the 34 hits ret
					1	1	1	1		
Powder	33 Hits Returned	Rank 1	Rank 3	Rank 4	Rank 5	Rank 6	Rank 8	Rank 10	Rank 19	Rank 20
HS-6	Lot Code F	Lot Code B	Lot Code H	Lot Code G	Lot Code I	Lot Code J	Lot Code A	Lot Code D	Lot Code E	Lot Code C
794	F - E = Rank 19	659	741	826	730	614	718	532	806	712
		1		1				1		
Powder	33 Hits Returned	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5	Rank 6	Rank 7	Rank 11	Rank 19
700-X	Lot Code G	Lot Code B	Lot Code A	Lot Code J	Lot Code C	Lot Code I	Lot Code F	Lot Code D	Lot Code E	Lot Code H
826	G - H = Rank 19	659	718	614	712	730	794	532	806	741
	-1									
Powder	39 Hits Returned	Rank 2	Rank 11	Rank 13	Rank 15	Rank 16	Rank 23	Rank 25	Rank 30	Rank 33
700-X	Lot Code H	Lot Code F	Lot Code I	Lot Code D	Lot Code B	Lot Code A	Lot Code J	Lot Code G	Lot Code C	Lot Code E
741	H - G = Rank 25	794	730	532	659	718	614	826	712	806
			1		1		1	1		
Powder	33 Hits Returned	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5	Rank 8	Rank 9	Rank 13	Rank 17
Universal	Lot Code I	Lot Code A	Lot Code B	Lot Code G	Lot Code F	Lot Code D	Lot Code J	Lot Code H	Lot Code C	Lot Code E
730	I - J = Rank 8	718	659	826	794	532	614	741	712	806
	1		1	-	i	1				
Powder	37 Hits Returned	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5	Rank 11	Rank 13	Rank 14	Rank 16
Universal	Lot Code J	Lot Code B	Lot Code G	Lot Code A	Lot Code F	Lot Code I	Lot Code D	Lot Code H	Lot Code C	Lot Code E

J - I = Rank 5

Implications...

The data clearly demonstrates that, when controlling for most variables, changes to cartridge pressure alone will affect the Ranking of searched images in NIBIN.

Since the charges selected were the minimum and maximum loads listed in the powder manufacturer's reloading manual, testing with higher and lower pressure loads are likely to amplify the variations in the rankings. Furthermore, it is likely to presume that changes made to any other characteristics of the components (i.e., primer type, bullet diameter, crimp, etc.) would continue to amplify the results.

Looking deeper into the rankings may be the best practice to identify potential "hits" until technology improves.

and More Questions...

Since the process used to select the casings that were entered into NIBIN was one of random selection, it is possible that the increases in standard deviations of ballistics in the lower pressure loads could have had an effect on the outcome of the research.

However, this random selection approach also ensured a closer connection to the "real world" scenario.

Continued research in this area should consider a more in depth analysis that would examine the rankings of each of the individual casings without the random selection. This would allow for the control of another variable.