RATING HANDGUN POWER

This Power Index Rating puts, finally, all handgun cartridges in their proper places.

by **EDWARD A. MATUNAS**

FOR A LONG TIME the best possible way to estimate the potential effectiveness of handgun ammunition has been to compare the kinetic energy developed by a given round of ammunition with the kinetic energy of other rounds. As you may know, kinetic energy figures are expressed in *foot pounds*. This method is a reasonable approach to the problem as it is very objective and it is supported by the laws of physics. It is, however, not without its shortcomings.

For example, the kinetic energy system shows us that a 38 Special using a 158-grain round nose bullet, travelling at 755 ft/s, has 200 foot pounds of energy. It also tells us that a 158-grain semi-wadcutter's bullet travelling at the same speed has the same energy. And while it is true that both bullets possess the identical energy, the semi-wadcutter is a superior performer. This performance superiority can be proven by shooting into gelatin blocks or by examining records based on actual shootings involving police officers.

The vagaries of the kinetic energy system for rating handgun ammunition are numerous. No knowledgeable shooter would expect a full metal jacket 9mm bullet to perform as well as an expanding bullet of the same caliber and weight traveling at the same velocity. The expanding bullet is vastly superior. And despite the similarities in energy, a factory 9mm Luger with a 124-grain full-metal case bullet at 339 foot pounds of energy will not perform as well as a factory 45 Auto with a 230-grain full metal case bullet at 335 pounds of energy.

A number of systems have been devised over the years to express a handgun bullet's ability to get the job done. One of the most publicized expressed the bullet's performance by listing its momentum. The various methods tried have failed because they have ignored or played down the bullet's kinetic energy.

In some circles, extensive testing has been conducted in various media to get the bullet to perform as it would in tissue. These tests, usually conducted by or for a well financed police department, have resulted in some very elaborate charts which graphically depict bullet performance. These charts have been a giant step forward as they indeed show the superiority of expanding bullets over otherwise identical non-expanding bullets, but the drawbacks are very real. First, they are not readily available to most shooters; Second, they are useless when a new round is being considered; Third, they are subject to errors created when test performance is nontypical, caused by a lot of ammunition with velocity above or below nominal velocity or by a firearm that produced nontypical results.

The shooter therefore has been left to choose ammunition using the objective value of the kinetic energy of the round combined with his intuitive and subjective reckoning on the per-

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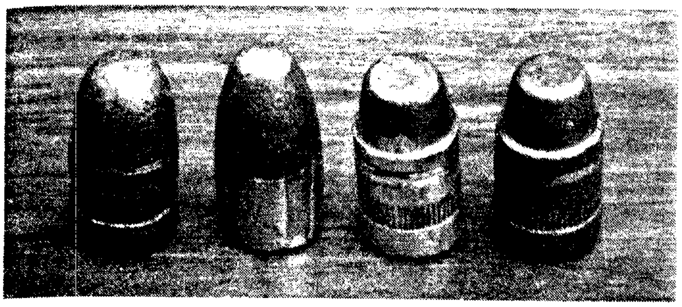
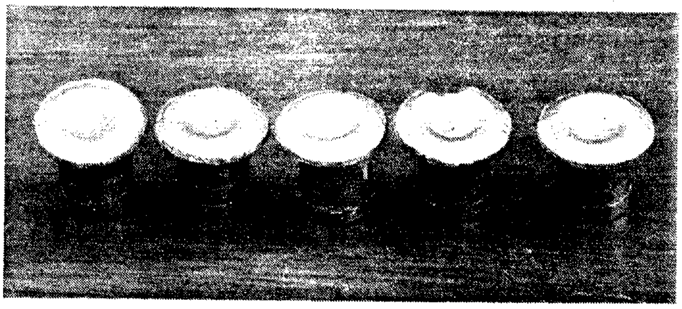
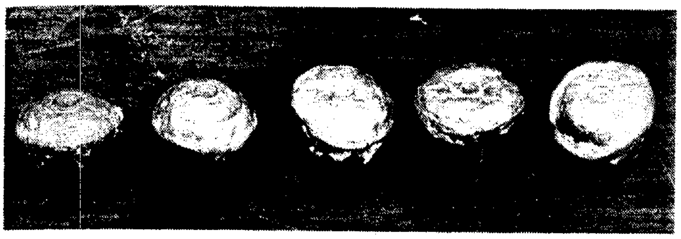


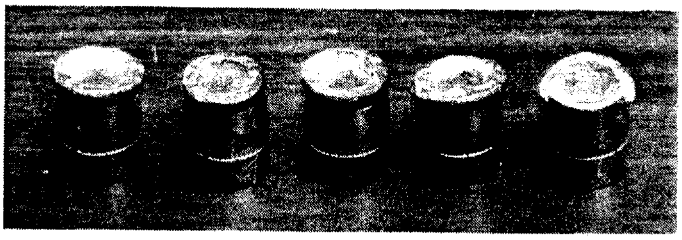
Here are a Speer 158-gr. round nose 38 Special bullet, unfired, and a 158-gr. Speer semi-wadcutter, fired and unfired. The PIR System clearly shows the superiority of the semi-wadcutter over the round nose. Both are non-expanding, carry different energy transfer values.



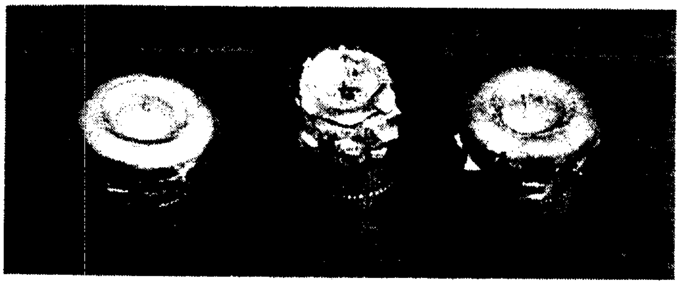
These are 158-gr. lead hollow point bullets. They were fired from a 2-inch revolver. These were loaded by Winchester as +P ammunition, and expansion was obviously perfect. Such bullet performance gains high ratings in the PIR System.



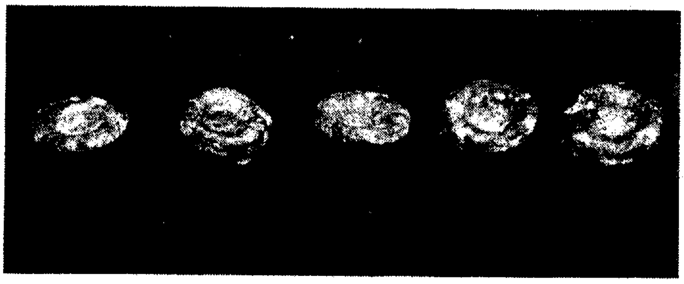
Classic expansion was obtained in a 3-inch 38 Special with these Sierra 125-gr. hollow points. These newest Sierra bullets feature jacket cuts at the nose. It is these cuts which allow such perfect expansion.



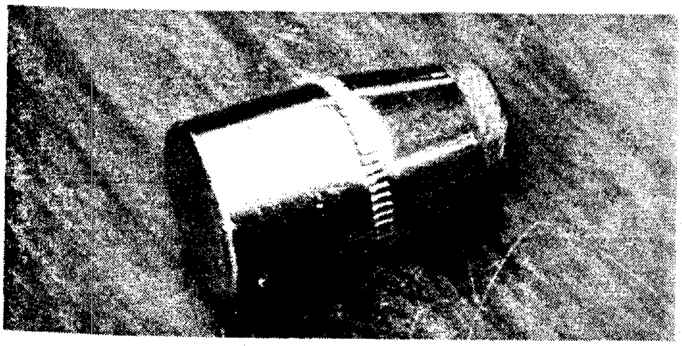
These are Speer 110-gr. 38-caliber hollow points fired from a 2-inch 38 Special revolver. While the nose lead smeared to some extent these bullets do not qualify as expanding bullets when fired from this length barrel at the tested velocity.



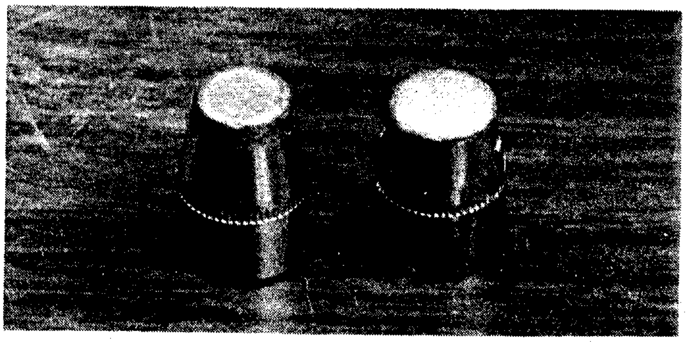
Shown are Winchester 85-gr. Silvertips fired from a 380 Auto. The bullets on either side were fired into thoroughly soaked phone book pages. The bullet in the middle was fired into identical material which had not yet become completely soaked. The importance of using 100% saturated phone books is clear.



Even the 140-gr. Sierra hollow points expanded when fired from a 2-inch S&W Chiefs Special. While expansion of this heavy bullet is not tremendous in such a short barrel, it is sufficient to give the bullet a maximum energy transfer value in the PIR System.



This is the Sierra 125-gr. jacketed hollow point unfired. There are notches or cuts in the jacket at the nose end, and it is these notches that make these new Sierra bullets predictably good expanders.



This shows an unfired 125-gr. Sierra soft point 38/357 bullet alongside of a fired bullet of the same make and style. No expansion took place when this bullet was fired in a 4-inch revolver, which is why each style and type of bullet needs to be tested for expansion.

formance of a particular bullet style. As often as not, this has led to a great many misconceptions. For instance, most handgunners feel the 45 Auto will outperform any 38 Special round. This simply is not so. A number of 38 Special high speed rounds which use expanding bullets are far superior to the standard 230-grain full-metal case 45 Auto bullets.

Of course, a shooter can resort to testing each and every interesting round in gelatin blocks. Or if he has great influence he could perhaps examine 5-6,000 case histories from a major police department's records of shootings. Neither approach is very practical.

I have devised a method that fully takes into account the bullet's kinetic energy, its shape, its ability to expand and its basic diameter. I have been working with the basic idea for almost 20 years and I have reworked the idea many more times than I care to admit. Each time I discovered a discrepancy it was back to the drawing board. The system now, in my opinion, is what it was intended to be—a reliable indicator of handgun bullet performance, regardless of the bullet style, caliber, velocity or weight being considered. I call this new system *Power Index Rating* or PIR. *(Note: I call it the Matunas Number. Editor.)*

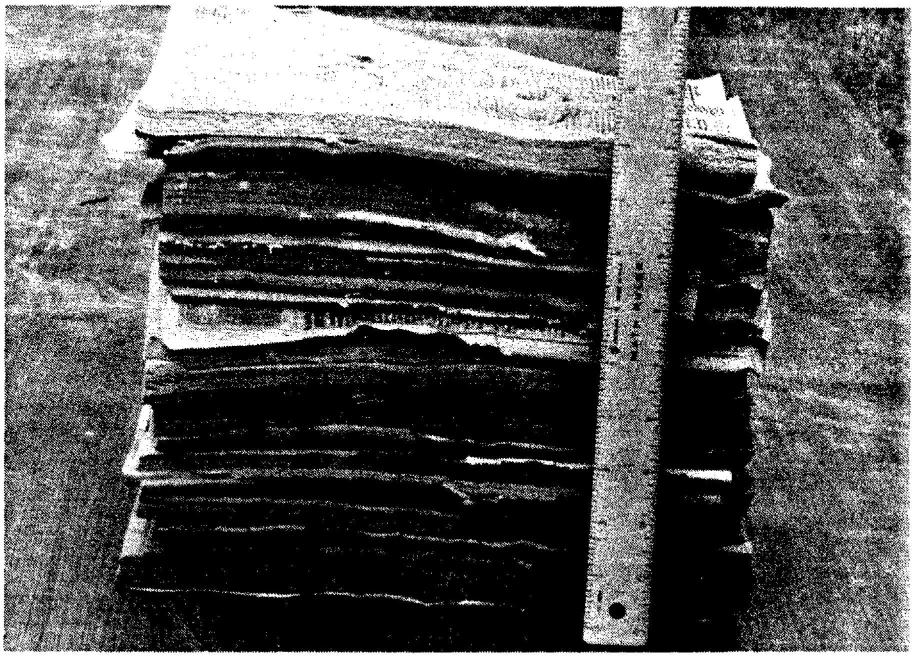
Any system which purports to express the ability to reflect an accurate representation of a bullet's capability to get the job done must somehow incorporate the bullet's kinetic energy. The formula for kinetic energy is, as you may know:

$$K.E. = \frac{V^2Bg}{450240}$$

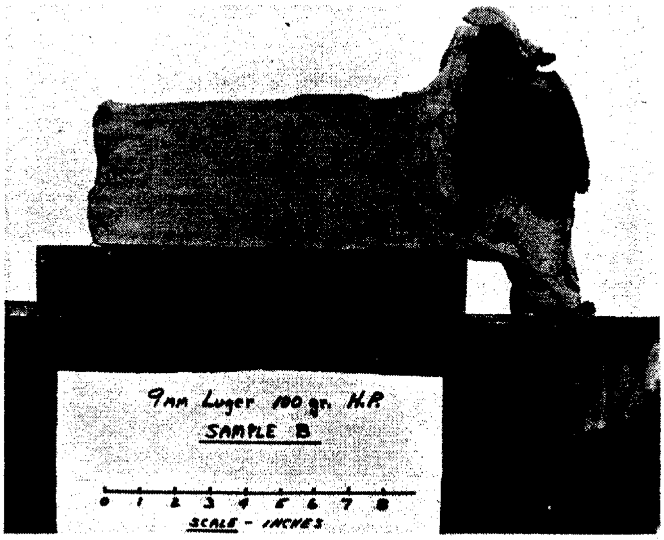
In this formula: V = the velocity in feet per second; and Bg = the weight of the bullet in grains.

By measurement, the weight of the bullet and its actual velocity can be determined. It is then a very simple matter to square the velocity, multiply the resulting figure by the bullet weight and divide all this by the constant 450240. The basis of the above formula has been verified and explained in a great number of places including my book, *American Ammunition and Ballistics*. Kinetic energy remains an important part of the PIR formula.

Any system to rate bullet performance must also address itself to the bullet's ability to expand because, as stated, an expanding bullet is far more effective than an identical non-expanding bullet at an identical velocity. And flat nosed, non-expanding bullets are better performers than other shapes of non-expanding bullets.



A 9-inch pile of soaked phone books stops all expanding bullets up to 115-gr. 9mm Luger rounds. For heavier calibers substantially greater thickness is required to stop the bullet in the books.

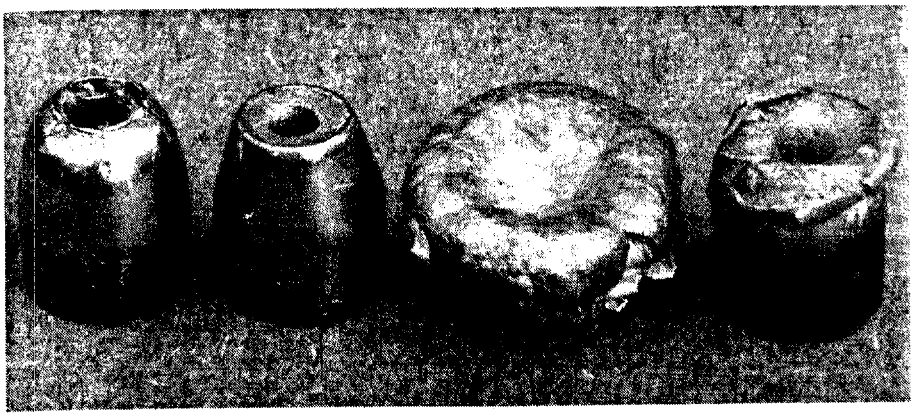


Bullet performance can, of course, be tested in clay blocks. However, such testing is very time-consuming and very costly. The author feels wet phone books are quicker, cheaper, and just as reliable.

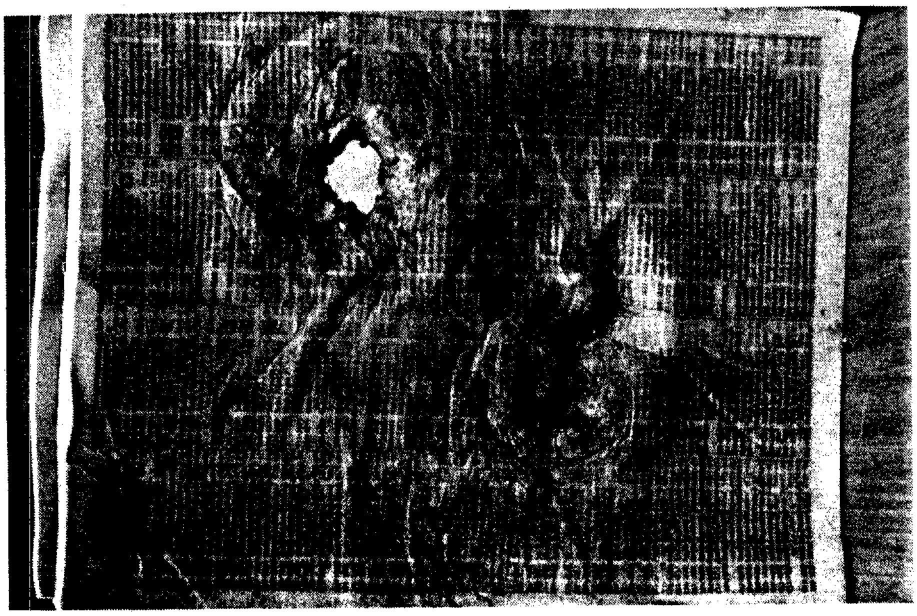
Since expansion is a vital part of bullet performance, I have tested a great number of bullets. As you may have expected, a number of bullets purported to be expanding turned out to be non-expanding. As an example, note the accompanying photo of three factory bullets fired from a 380 Auto PPK/S Walther. One is a Remington 88-grain Hollow Point, one is a Federal 90-grain Hollow Point, and one is a Winchester 85-grain Silvertip Hollow Point. Neither the Remington nor the Federal bullet expanded, while the Winchester bullet expanded in a classic style. Obviously in this case, with three almost identical bullets at nearly identical velocities, the expanding bullet is a far superior performer. All of my bullet tests were 15-round tests, at minimum.

You can easily duplicate my expansion tests. It is not necessary to prepare elaborate blocks of ordnance gelatin. All you need is a good supply of thoroughly soaked telephone books. It will speed up the soaking process if you remove the covers and backing which hold the books together. Before testing flip through the pages to make certain all the pages are completely wet.

WARNING: Bullets will penetrate through a much greater thickness of dry pages than through wet pages.



Left to right: Remington 88-gr. hollow point, Federal 90-gr. hollow point, Winchester 85-gr. Silvertip, and Speer 100-gr. hollow point (a reload). Only the Silvertip proved to be a reliable expanding bullet from a PPK/S pistol. The PIR System rates the Winchester load considerably higher than any of the other loads.



Holes in these pages were made with a 380 Auto. The large hole was made by an 85-gr. Winchester Silvertip which expanded perfectly. The others were made by Federal 90-gr. hollow point and a Remington 88-gr. hollow point. The channel created by the expanding bullet is much larger than its expanded diameter. The PIR System will accurately reflect such differences in bullet performance.

And bullet expansion in dry pages will be extremely poor. Be certain that the book pages are completely soaked.

A 9 to 10-inch stack of wet phone books will stop expanding bullets up to and including the 9mm Luger. For heavier calibers or for non-expanding bullets you will have to increase this thickness notably. Be certain your bullets stop inside the wet paper. Bullets which completely penetrate can be severely expanded against your backstop.

For my testing I dug a hole in the ground about 24 inches deep. I poured a concrete floor some 5 inches thick in the bottom of the hole. The concrete aided in holding water and insured that the book pages would lie flat. At the beginning of my tests I failed to use enough paper and two different bullets hit the concrete and flattened out to about the thickness of a quarter. Expansion looked tremendous. Both bullets however, completely failed to expand when they hit an adequate thickness of wet pages. A bullet in tissue will perform very differently than a bullet hitting a very hard object.

The wet phone books produce a very visual impression of a bullet's performance. The hole from a high velocity expanding bullet will be considerably larger than the bullet's actual expanded diameter. The holes left by non-expanding bullets will be quite small. Good expanding bullets will actually cause an eruption of tiny wet particles out of the bullet hole. The width and depth of the bullet hole will be a good indicator of bullet performance. However, for our purposes you simply need to determine if a bullet will reliably expand shot after shot. Therefore I suggest that you test no less than 5 and preferably as many as 15 bullets.

Establishing expansion is essential, as my formula for determining the bullet's Power Index Rating applies a factor for expanding bullets and a different factor for non-expanding, flat nosed bullets and still a different factor for non-expanding, non-flat nosed bullets. My formula also allows for the increased performance of larger diameter bullets. Be certain that you test for expansion at the range (velocity level) for which you wish to determine performance. Some bullets expand well at 7 yards or from a given barrel length, but fail to expand at longer ranges or from shorter barrels.

The formula for the Power Index Rating of handgun ammunition started out as:

$$\text{PIR} = \frac{V^2\text{ETvBg}}{(450240 \times 269)} \times \text{Dv}$$

In this formula: V = Velocity in feet per second; ETv = an Energy Transfer value; Bg = the Weight of the Bullet in Grains; Dv = A Bullet Diameter value.

The PIR formula retains all the factors involved in obtaining kinetic energy figures $\left(\frac{V^2\text{Bg}}{450240}\right)$, plus it allows for bullet shape and expansion or lack thereof (ETv) and also for basic caliber size (Dv). Additionally, it allows a factor (269) that will bring a specific level of cartridge performance to a value of 100. Most handgun ammunition performance is geared to defensive use, so I have used a constant that will result in a value of 100 for any cartridge/bullet combination that would prove to be highly effective as a man-stopper at short ranges and neither lighter nor heavier than needed.

This value was assessed equal to a 38-caliber bullet of 158 grains, capable of expansion at a muzzle velocity of 875 feet per second. This level of performance is generally accepted by a large number of progressives who have adopted the 38 Special +P 158-grain lead hollow-point load. It is important to realize that if you disagree with this performance level the formula still remains completely accurate. You can simply select a value higher than 100 to represent your minimum acceptable level of cartridge performance.

In the interest of making the formula easier to use, the original values for ETv (Energy Transfer Value) were modified simply by moving the decimal position. This allowed for the constant factor of (450240 × 269) to be reduced to 12111, thus giving a more manageable formula of:

$$PIR = \frac{V^2 ETvBg}{12111} \times Dv$$

As in the earlier formula: V = Velocity in feet per second; ETv = Energy Transfer Value; Bg = Bullet Weight in Grains; Dv = Bullet Diameter Value.

The ETv values were arrived at only after years of research and trial and error applications. These values now used have been proven correct in every conceivable application. They are as follows:

Bullet Type	ETv Value
Bullets that actually expand	.0100
Non-expanding flat-nose bullets	.0085
Other non-expanding bullets	.0075

A bullet qualifies as a non-expanding flat-nosed bullet only if it has a total flat area equal to 60% or more of its diameter. All wadcutter and semi-wadcutter bullets that I have examined qualify for the flat nosed ETv. Almost all other non-expanding bullets have an ETv of .0075. To any "expanding" bullet that does not actually expand should be applied one of the non-expanding ETv's. For instance, the 88-grain Remington Hollow Point 380 Auto bullet that failed to expand in our tests received an ETv of .0075. The Federal 90-grain bullet for the 380 Auto also failed to expand. But it had a relatively flat profile and therefore received an ETv of .0085.

It is vital to the application of the formula that you determine whether or not a bullet expands in your use. You can do so from the included data chart or by actual firing into wet phone books. If the barrel length of your gun is shorter than our test firearm then, due to reduced velocity, a bullet that expanded in our test gun may fail to expand in your shorter barrel. *You must apply the correct ETv value if the formula is to express the real potential of any particular gun/cartridge combination.* For a shorter or longer barrel, an appropriate velocity correction must be made. For my tests and charts I used four-inch barrels for most of the data collection. In some calibers, I have included data for other lengths.

The Dv values for bullet diameters have been proven to be correct in application as follows:

Actual Bullet Diameter	DV Value
.200″ to .249″	0.80
.250″ to .299″	0.85
.300″ to .349″	0.90
.350″ to .399″	1.00
.400″ to .449″	1.10
.450″ to .499″	1.15

Obviously some very fine lines were drawn when establishing the Dv values. However, the values used have been carefully checked against actual performance records. I am unaware of any case where a Power Index Rating derived from the formula did not accurately reflect the performance of a bullet in actual usage.

As an example of the formula's application, let's run through a simple exercise.

Question: How does the 38 Special 95-grain SJHP Remington Factory +P load compare to the 38 Special 158-grain LHP Winchester factory +P load in a three-inch barrel? By measurement, the 95-grain Remington bullet delivers a velocity of 1100 ft/s and the Winchester 158-grain bullet delivers a velocity of 875 ft/s.

To determine our answer we have the following:

$$PIR = \frac{V^2 ETvBg}{12111} \times Dv$$

Remington Bullet

(As specified in a 3″ barrel)

$$PIR = \frac{1100^2 \times .0100 \times 95}{12111} \times 1.0$$

$$PIR = \frac{1149500}{12111} \times 1.0$$

Here are a fired and an unfired Speer 100-gr. 9mm bullet, and Winchester 115-gr. Silvertip 9mm's also unfired and fired. Most 9mm Luger expanding bullets perform very well but these two types afford classic expansion every time at all practical ranges.

At extreme ranges, even the superb Winchester 9mm Silvertip hollow point will fail to expand. Here are a 158-gr. 38 Special semi-wadcutter and two 115-gr. 9mm Silvertips. These bullets were loaded to 125-yard velocity; the results illustrate that when velocity gets low enough even the best of expanding bullets fail to work.

$$PIR = 94.913715 \times 1.0$$

(Round to nearest whole number)

Power Index Rating = 95

Winchester Bullet

(As specified in a 3″ barrel)

$$PIR = \frac{875^2 \times .0100 \times 158}{12111} \times 1.0$$

$$PIR = \frac{1209687.5}{12111} \times 1.0$$

$$PIR = 99.88337 \times 1.0$$

(Round to nearest whole number.)

Power Index Rating = 100

Therefore, the Winchester load in question will perform at a somewhat (5.3%) higher level than the Remington load. Obviously, in a shorter barrel the results would be somewhat different. In a two-inch barrel, the results would be as follows, given a velocity of 990 ft/s for the Remington bullet, which will still expand, and a velocity of 790 ft/s for the Winchester bullet which also still expands:

Remington Bullet

(As specified in a 2″ barrel)

$$PIR = \frac{990^2 \times .0100 \times 95}{12111} \times 1.0$$

$$PIR = \frac{931095}{12111} \times 1.0$$

$$PIR = 76.880109 \times 1.0$$

$$PIR = 76.880109$$

(Rounded to nearest whole number.)

Power Index Rating = 77

Winchester Bullet

(As specified in a 2″ barrel)

$$PIR = \frac{790^2 \times .0100 \times 158}{12111} \times 1.0$$

$$PIR = \frac{968078}{12111} \times 1.0$$

$$PIR = 81.42003 \times 1.0$$

$$PIR = 81.42003$$

(Rounded to nearest whole number.)

Power Index Rating = 81

Thus a two-inch barrel, in this caliber and with the ammunition being considered, is some 23% less effective than a three-inch barrel.

It can be seen from the above that our formula fully allows for velocity changes, kinetic energy changes, expansion (or lack of expansion) and basic bullet diameters. The formula shows that the heavy lead bullet load was superior to the other in both barrels.

Earlier we stated that the 124-grain FMC 9mm Luger factory load (velocity of 1110 ft/s) possessed almost identical kinetic energy (339 foot pounds) to a 45 Auto 230-grain FMC factory load (velocity of 810 ft/s) with 335 foot pounds. We said that in actual usage the 45 Auto round would outperform the Luger round. Let's apply the PIR formula to both of these loads to see if it reflects the superiority of the 45 load.

$$PIR = \frac{V^2 ETvBg}{12111} \times Dv$$

9mm Luger Bullet

(As specified)

$$PIR = \frac{1110^2 \times .0075 \times 124}{12111} \times 1.0$$

$$PIR = \frac{1145853}{12111} \times 1.0$$

$$PIR = 94.612584 \times 1.0$$

$$PIR = 94.612584$$

(Round to nearest whole number)

Power Index Rating = 95

PIR

Formula and Values for Power Index Rating of Handgun Ammunition

$$\text{Power Index Rating: } PIR = \frac{V^2 ETvBg}{12111} \times Dv$$

In which:
- V = Velocity in feet per second
- ETv = Energy Transfer Value
- Bg = Bullet Weight in Grains
- Dv = Diameter Value of Bullet

ETv Values:

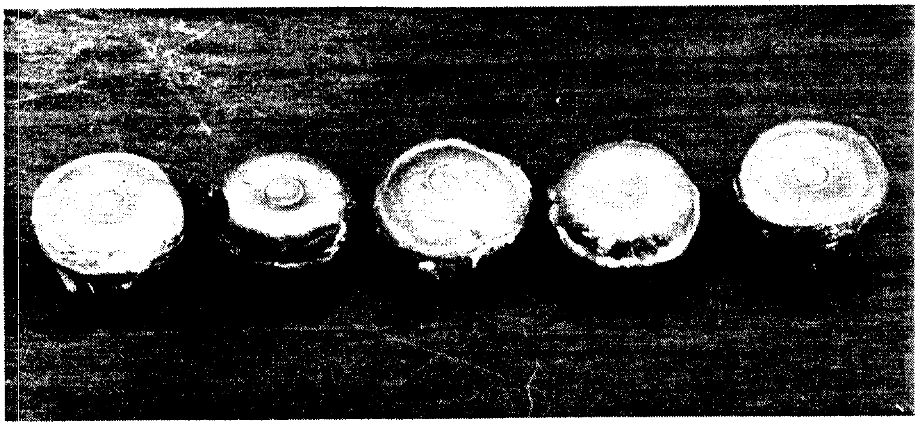
For all bullets that actually expand[1]	= .0100
For non-expanding bullets with a flat nose equal to 60% of diameter	= .0085
For all other non-expanding bullets	= .0075

[1]Determined by actual test at range and velocity for which Power Index Rating is desired.

Dv Values

Actual Bullet Diameter	Value
.200″ to .249″	0.80
.250″ to .299″	0.85
.300″ to .349″	0.90
.350″ to .399″	1.00
.400″ to .449″	1.10
.450″ to .499″	1.15

These three fired Speer 100-gr. 9mm Luger hollow points were recovered from wet phone books at 7 yards. They perform as well or better than most of the bullets the author has tested and so are favorites for hunting varmints with a handgun. They would, of course, attain very high ratings in the PIR System.



The difference in barrel length with regard to bullet expansion is clearly shown by these photos. The bullets above were fired from a 4-inch revolver and those below from a 3-inch revolver. The loads are identical. The velocity gain in the longer barrel produced classic expansion while the shorter barrel results were almost marginal for expansion, as evidenced by the third bullet.

45 Auto Bullet

(As specified)

$$PIR = \frac{810^2 \times .0075 \times 230}{12111} \times 1.15$$

$$PIR = \frac{1131772.5}{12111} \times 1.15$$

$$PIR = 93.449963 \times 1.15$$

$$PIR = 107.46746$$

(Round to nearest whole number.)

Power Index Rating = 107

The clear advantage of the 45 Auto in actual usage is indicated by the formula showing it 12.6% more efficient. To further prove our point let's consider a 9mm Luger round loaded with a 115-grain Silvertip Hollow Point to a velocity of 1255 ft/s (a Winchester factory load). This bullet does expand remarkably well.

$$PIR = \frac{V^2ETvBg}{12111} \times Dv$$

$$PIR = \frac{1255^2 \times .0100 \times 115}{12111} \times 1.0$$

$$PIR = \frac{1811278.7}{12111} \times 1.0$$

$$PIR = 149.5564 \times 1.0$$

$$PIR = 149.5564$$

(Round to nearest whole number.)

Power Index Rating = 150

PIR GUIDELINES

Level	PIR Values	Application
1	24 or less	Loads within this value range should never be used for personal protection. They are suitable only for target shooting and plinking.
2	25 to 54	Loads in this value grouping would require very exact bullet placement if used for personal defense. If a killing shot was not made, your antagonist might only be further enraged. Loads in this group could prove satisfactory for small game but must be considered less than satisfactory for personal defense.
3	55 to 94	Loads within this PIR grouping are somewhat popular as personal defense weapons. However, the experience of many people shows these cartridges to be marginal even when good hits are made. Many police departments are armed with cartridges in this group. However, more than one police officer has lost his life when he was unable to stop an assailant with a load from this group. Loads in this category must be considered at best marginal.
4	95 to 150	Loads fitting in this category will meet the requirements of most military applications. They will also prove adequate for police departments that wish to arm personnel with weapons that are likely to prove effective under almost any situation. These are ideal loads for personal protection. Many police departments are now equipping their men with loads from this grouping.
5	151 to 200	Loads in this range will usually take the fight out of any opponent with only fairly placed hits. However, loads of this power level are difficult to control and most shooters have trouble scoring hits due to the recoil and noise levels. With extensive practice they can be mastered and prove useful to a highly skilled shooter.
6	201 or more	Loads in this category are best described as overkill in self-defense. They are hunting loads best used for protection from bears gone crazy rather than against human opponents. Few shooters can develop the necessary skills to handle the very heavy recoil and noise levels of cartridges with PIR values in the 200 plus range.
	PLEASE NOTE:	It is impossible to suggest specific values for any specific application unless all the criteria are known. The above table is offered as a general guideline.

POWER INDEX RATING CHART

CALIBER	BULLET			POWDER						
	Wgt./Grs.	Brand	Style	Type	Wgt./Grs.	Barrel Length (Inches)	Velocity in ft/s	Bullet Expansion	Kinetic Energy in Foot Pounds	Power Index Rating
22 Short SV	29	all	LRN	Factory Load		6	865	No	48	11
22 Short HV	29	all	LRN	Factory Load		6	1010	No	66	15
22 Long HV	29	all	LRN	Factory Load		6	1095	No	77	17
22 Long Rifle SV	40	all	LRN	Factory Load		6	950	No	80	18
22 Long Rifle HV	40	all	LRN	Factory Load		6	1060	No	100	22
22 Long Rifle HV	37	CCI	LHP	Factory Load		6	1080	Yes	96	29
22 MRF	40	all	JHP	Factory Load		6½	1480	Yes	195	58
22 Jet	40	Rem.	JSP	Factory Load		8⅜	2100	Yes	392	117
25 Auto	45	Win.	EP	Factory Load		2	835	Yes	70	22
25 Auto	50	Rem.	FMC	Factory Load		2	810	No	73	17
30 Luger	93	all	FMC	Factory Load		4½	1220	No	307	77
32 Short Colt	80	all	LRN	Factory Load		4	745	No	99	25
32 Auto	71	Win.	FMC	Factory Load		4	905	No	129	32
32 Auto	60	Win.	STHP	Factory Load		4	970	Yes	125	42
32-20 WCF	100	Win.	LFN	Factory Load		6	1030	No	237	67
9mm Luger	95	Win.	JSP	Factory Load		4	1355	Yes	387	144
9mm Luger	115	Win.	FMC	Factory Load		4	1155	No	341	95
9mm Luger	115	Win.	STHP	Factory Load		4	1255	Yes	402	150
9mm Luger	115	Fed.	JHP	Factory Load		4	1165	Yes	347	129
9mm Luger	124	Rem.	FMC	Factory Load		4	1110	No	339	95
9mm Luger	100	Speer	JHP	231	5.8	4	1300	Yes	375	140
9mm Luger	125	Speer	JSP	231	5.6	4	1150	Yes	367	136
38 Special + P	95	Rem.	JHP	Factory Load		2	990	Yes	207	77
38 Special + P	95	Rem.	JHP	Factory Load		3	1100	Yes	255	95
38 Special + P	95	Rem.	JHP	Factory Load		4	1175	Yes	291	108
38 Special + P	95	Win.	STHP	Factory Load		2	945	Yes	188	70
38 Special + P	95	Win.	STHP	Factory Load		3	1050	Yes	233	86
38 Special + P	95	Win.	STHP	Factory Load		4	1100	Yes	255	95
38 Special + P	110	all	JHP	Factory Load		2	880	Yes	189	70
38 Special + P	110	all	JHP	Factory Load		3	975	Yes	232	86
38 Special + P	110	all	JHP	Factory Load		4	1020	Yes	254	94
38 Special + P	110	Sierra/ Speer	JHP	231	5.9	6	1090	Yes	290	108
38 Special + P	110	Sierra/ Speer	JHP	Bullseye	5.4	6	1090	Yes	290	108
38 Special	110	Sierra	JHP	800-X	7.2	3	950	Yes	220	82
38 Special + P	125	all	JHP	Factory Load		4	945	Yes	248	92
38 Special + P	125	Sierra/ Speer	JHP	231	5.6	6	990	Yes	272	101
38 Special	125	Sierra	JHP	800-X	6.9	3	875	Yes	213	79
38 Special + P	140	Sierra/ Speer	JHP	231	5.5	6	935	Yes	272	101
38 Special + P	158	Win.	LHP	Factory Load		2	790	Yes	219	81
38 Special + P	158	Win.	LHP	Factory Load		3	875	Yes	269	100
38 Special + P	158	all	LHP	Factory Load		4	915	Yes	294	109
38 Special	148	all	LWC	Factory Load		2	525	No	91	29
38 Special	148	all	LWC	Factory Load		3	575	No	109	34
38 Special	148	all	LWC	Factory Load		4	710	No	166	52
38 Special	148	all	LWC	231	3.0	2	550	No	99	31
38 Special	148	all	LWC	231	3.0	3	600	No	118	37
38 Special	148	all	LWC	231	3.0	6	750	No	185	58
38 Special	158	all	LRN	Factory Load		2	630	No	139	39
38 Special	158	all	LRN	Factory Load		3	700	No	172	48
38 Special	158	all	LRN	Factory Load		4	755	No	200	56
38 Special	158	all	LSWC	Factory Load		2	630	No	139	44
38 Special	158	all	LSWC	Factory Load		3	700	No	172	54
38 Special	158	all	LSWC	Factory Load		4	755	No	200	63
38 Special	158	Speer	LSWC	231	4.3	2	655	No	151	48
38 Special	158	Speer	LSWC	231	4.3	3	725	No	184	58
38 Special	158	Speer	LSWC	231	4.3	6	850	No	254	80
38 Special	158	Rem.	LSWC	800-X	5.9	6	880	No	272	86
38 Special	200	all	LRN	Factory Load		2	545	No	132	37
38 Special	200	all	LRN	Factory Load		3	600	No	160	45
38 Special	200	all	LRN	Factory Load		4	630	No	176	49
38 Special	200	Rem.	LRN	800-X	4.6	6	725	No	233	65
38 S & W	145	all	LRN	Factory Load		4	685	No	151	42
357 Magnum	110	all	JHP	Factory Load		4	1295	Yes	410	152
357 Magnum	110	Speer	JHP	231	8.8	6	1370	Yes	459	170
357 Magnum	125	all	JHP	Factory Load		4	1450	Yes	584	217
357 Magnum	125	Speer	JHP	231	8.6	6	1310	Yes	476	177
357 Magnum	140	Speer	JHP	231	8.0	6	1200	Yes	448	166
357 Magnum	158	all	JHP	Factory Load		4	1235	Yes	535	199
357 Magnum	158	Speer	JHP	Unique	8.2	6	1200	Yes	505	188
38 Super + P	130	all	FMC	Factory Load		5	1245	No	448	125
38 Super + P	125	Win.	JHP	Factory Load		5	1280	Yes	455	169
380 Auto	85	Win.	STHP	Factory Load		3	1000	Yes	189	70
380 Auto	88	Rem.	JHP	Factory Load		3	990	No	192	53
380 Auto	90	Fed.	JHP	Factory Load		3	1000	No	200	63
380 Auto	95	all	FMC	Factory Load		3	955	No	192	54
41 Magnum	210	all	JSP	Factory Load		4	1300	Yes	778	322
41 Magnum	210	all	LSWC	Factory Load		4	965	No	434	151
44 Special	246	all	LRN	Factory Load		4	755	No	311	96
44 Magnum	240	all	JHP	Factory Load		4	1180	Yes	742	304
44 Magnum	240	all	LSWC	Factory Load		4	1350	Yes	971	397
44 Magnum	200	Speer	JHP	2400	23.0	7½	1475	Yes	966	395
45 Auto	185	Win.	STHP	Factory Load		5	1000	Yes	411	176
45 Auto	230	all	FMC	Factory Load		5	810	No	335	107
45 Auto	185	all	JWC	Factory Load		5	770	No	244	89
45 Auto	200	Speer	JHP	231	6.3	5	950	Yes	401	171
45 Colt	225	Win.	STHP	Factory Load		5½	920	Yes	423	181
45 Colt	225	Fed.	LHP	Factory Load		5½	900	Yes	405	173
45 Colt	255	all	LRN	Factory Load		5½	860	No	419	134

Abbreviations used for bullet style: **LRN** = Lead Round Nose; **LHP** = Lead Hollow Point; **JSP** = Jacketed Soft Point; **FMC** = Full Metal Case, Round Nose; **STHP** = Silvertip Hollow Point; **LFN** = Lead Flat Nose; **JHP** = Jacketed Hollow Point; **LWC** = Lead Wadcutter; **LSWC** = Lead Semi-Wadcutter; **JWC** = Jacketed Wadcutter; **EP** = Expanding Point.

In this example we find the expanding 115-grain bullet load in the 9mm Luger vastly superior to the 124-grain non-expanding bullet load in the same caliber and also greatly superior to the 45 Auto 230-grain non-expanding bullet. And this is a very real reflection of the various loads' effectiveness in actual usage.

Because the PIR formula takes every possible aspect into account, the use of a wrong value or a wrong velocity can cause serious errors. For this reason, if you wish to compare the Power Index Rating of any given load at 25 or 50 yards (or any other range) you must first determine if your chosen load will offer bullet expansion at the range in question and then apply the correct ETv value. You will also need to know the exact velocity of your load at the range in question. Velocities may be obtained by actual measurement with a chronograph or from various data sources. After you have used it, the Power Index Rating system will prove itself to you as an unfaltering, easy-to-use system that will reflect a bullet's actual performance. *(Please keep in mind that everything connected with the PIR system is copyrighted. Any one is free to use the system; however no commercial application of the PIR may be made without the written consent of the author.)*

The Power Index Rating system has been applied to rifle cartridges wherein a value of 1000 equals an adequate amount of power to kill game of 300 pounds. However, almost all rifle bullets are of the expanding type, so the current kinetic energy levels continue to be fairly accurate appraisals of a load's worth.

I cannot over-stress establishing the actual velocity obtained with your handgun. This is particularly true in guns with three-inch or shorter barrels. In such guns, actual firearm dimensions can cause significant changes in velocities from one handgun to another, even the same brand, model and barrel length.

In testing two two-inch 38 Special revolvers, I found one would give consistent expansion with a 110-grain hollow point load while the other revolver wouldn't expand that or any other tested load. Results in four-inch or longer barrels are far more consistent and one can usually count on similar results from one gun to the next. Velocity averages should be taken from 15-shot strings, at least; 5-shot strings do not reveal average velocities sufficiently.

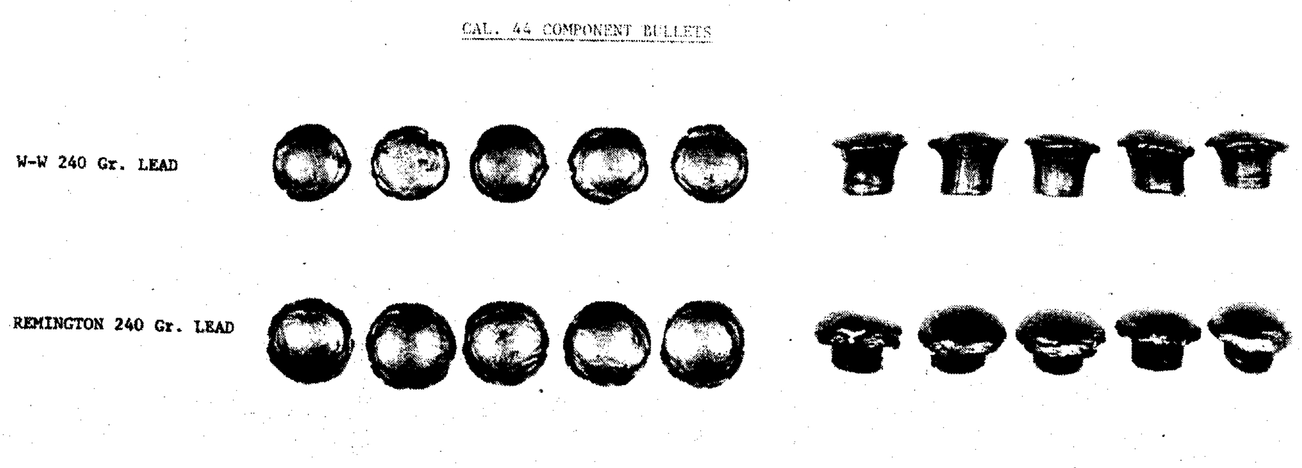
Bullet expansion does not always occur when one might expect. For example, the new Sierra 125-grain Hollow Point bullets will reliably expand in my three-inch S & W Chief's Special when pushed by 6.9 grains of DuPont 800-X. The Sierra 125-grain Soft Point bullet will not show the slightest trace of expansion with the same powder charge. In fact, there is no load that will cause expansion of the Soft Point bullet in that gun. The new Sierra 38/357 Hollow Point bullets with notches cut into the jacket nose have proven to be the very best expanding handgun bullets normally available to reloaders.

In two-inch 38 Specials one must stay with 95 to 110-grain bullets if positive expansion is desired. Very few will offer any expansion with heavier bullets and none of those I have tested would offer expansion with bullets over 125 grains unless +P loads are used. In three-inch 38 Specials bullets up to 125 grains can usually be made to expand reliably *if* you select the proper bullet and powder charge. +P loads will offer expansion regardless of bullet weight. And in four-inch 38 Specials, bullets up to 140 or 158 grains will often expand if good bullets are used with appropriate powder charges.

Other calibers are equally affected by changes in barrel length.

Please keep in mind +P loads must be avoided in any aluminum frame revolver. Many shooters have found the Speer 110-grain Hollow Point 38 Special ammunition loaded to standard pressures, will offer expansion in three-inch or longer 38 Specials when no other standard pressure ammunition will. This load is worth investigating when you want maximum performance from an alloy frame revolver.

There are a number of good bullets which offer good expansion in handguns of various calibers, properly used. The accompanying chart lists many popular loads for you. If you want to select maximum performance ammunition for your handgun it is up to you to assure, by testing, that the bullet you use will expand. The Power Index Rating system clearly shows only expanding bullets get the maximum potential from a handgun. If a load that interests you is not in the table, apply the PIR formula after determining if the bullet will expand in your gun. ●



Only the 44 Magnum was capable of driving lead semi-wadcutters fast enough to insure the positive expansion of this style bullet. The 44 S&W Special won't do it.