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Tactical Briefs (Volume 2, Number 6)
June 1999

.223 Remington Ammunition for Personal Defense/Law Enforcement

IWBA member Gary Roberts performed terminal performance testing of twenty-three different .223 Remington loads and published his results as follows:

- Roberts, GK: "The Wounding Effects of 5.56mm/.223 Law Enforcement General Purpose Shoulder Fired Carbines Compared With 12 Ga. Shotguns and Pistol Caliber Weapons using 10% Ordnance Gelatin as a Tissue Simulant." Wound Ballistics Review, 3(4); Autumn 1998, and
- Roberts, GK: "Law Enforcement General Purpose Shoulder Fired Weapons -- The Wounding Effects of 5.56mm/.223 Carbines Compared With 12 Ga. Shotguns and Pistol Caliber Weapons using 10% Ordnance Gelatin as a Tissue Simulant." Police Marksman, July/August 1998.

As a result of his testing, Roberts recommended nine cartridges. Three of these cartridge recommendations are available only to law enforcement, whereas the remaining six are (or were) commercially available.

We investigated the availability of these loads and offer the following commentary:

Winchester Supreme Match 69gr JHPBT (S223M) was discontinued in 1998 and is no longer available.

Federal 69gr JHP (223M) was tested and recommended by Roberts but we're unable to find any load under this product number in Federal's catalog. (We're unwilling to assume that the Federal .223 Remington 69gr JHP 223M cartridge, tested by Roberts, is the same as the currently available Gold Medal Match GM223M load.) Attempts to contact Roberts for clarification were unsuccessful.

Federal 55gr Tactical JSP (LE223T1) is available to law enforcement agencies only. This bullet produces the least amount of tissue disruption of all the .223 cartridges recommended by Roberts. The bullet does not fragment very much. Its performance is not much of an improvement over a .22 Long Rifle 40gr lead HP.

Winchester 64gr JSP (Q3246 "Knurled") is a California Highway Patrol contract load which uses the 64gr Power-Point bullet with a cannelure. According to a Winchester spokesman, this load is also available to other law enforcement agencies upon request. The CHP specifies a cannelure to prevent bullet setback, and subsequent feeding failures, in its AR-15 rifles.

Olin M855/Winchester 62gr FMJ (RA556M855) is from Winchester's Ranger line of law enforcement ammunition. Whether or not other manufacturer's M855/SS109-type ammunition delivers similar performance is unknown.

Black Hills 60gr JSP, 68 grain JHP and 75gr JHP are recommended by Roberts. We contacted Black Hills ammunition company and confirmed that the cartridges tested by Roberts used the same bullets as current production ammunition.

Olin M193/Winchester 55gr FMJ (X223R1) is recommended. This load is available as Winchester USA Q3131. Whether or not other manufacturer's M193-type ammunition delivers similar performance is unknown.

Although Roberts tested Winchester's 64gr Power-Point JSP cartridge (X223R2), and found it acceptable, he did not specifically recommend its use in autoloading carbines and SMGs. There is no cannelure on the bullet, and Roberts alludes to feeding failures caused by bullet setback in the case mouth. In 1999 Winchester began offering a moly-coated 64gr Supreme Power-Point Plus load (SHV223R2), which develops slightly greater velocity than the 64gr Super-X Power-Point JSP load. Both the Supreme and Super-X loads use the same bullet.

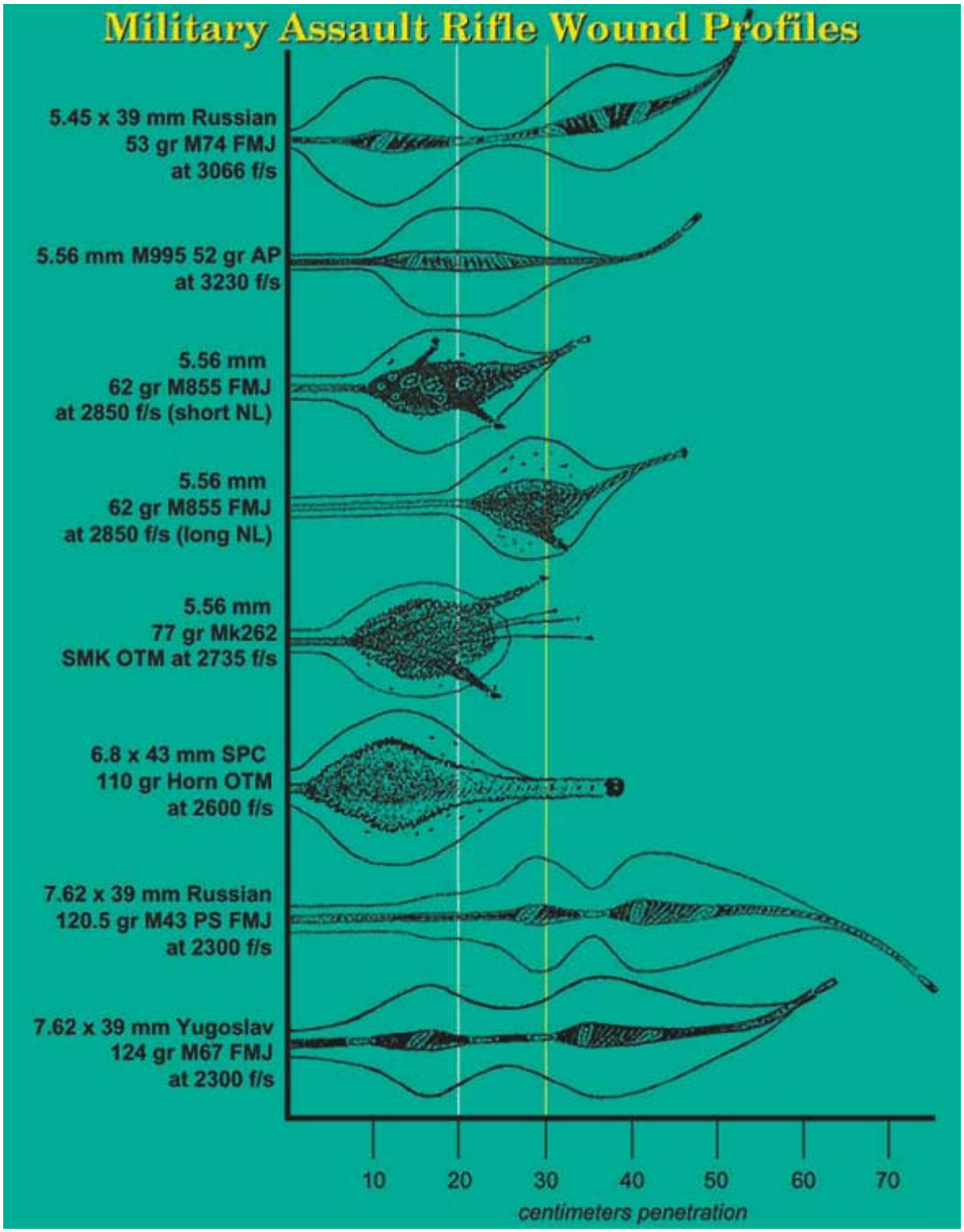
The critical minimum velocity for obtaining maximum terminal performance from .223 Remington/5.56mm ammunition is approximately 2700 fps. Bullets that are propelled below this velocity do not provide optimal terminal performance, and thus are less capable of creating wound trauma that will produce rapid incapacitation of a criminal attacker.

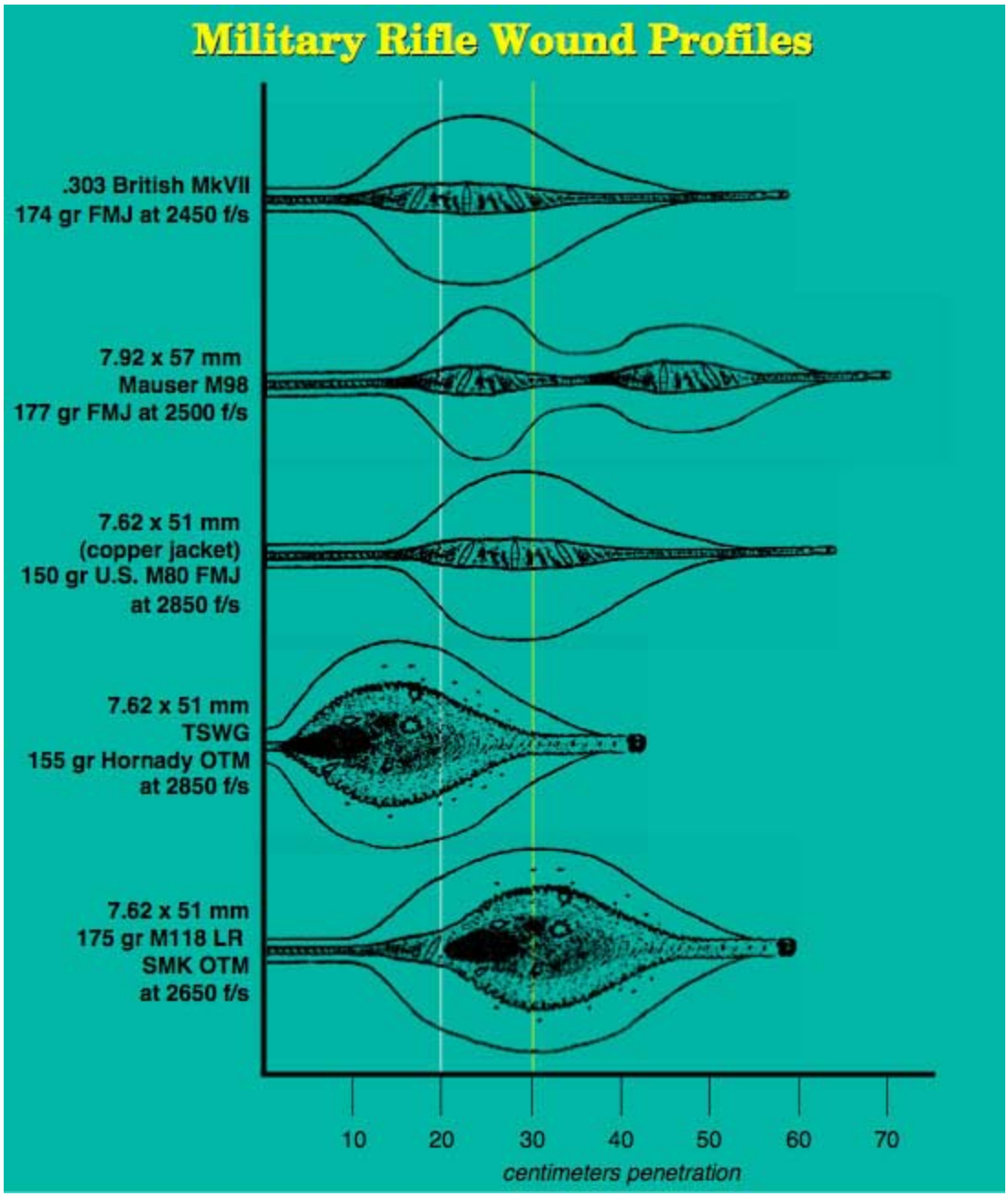
RIFLE AMMUNITION

The criteria for rifle ammunition is essentially the same as for handgun bullets, and many of the same design factors apply. One important difference for rifle ammunition is that the velocities are much higher, and the effect of the temporary cavity starts contributing quite a bit towards creating damage, especially as one moves up in caliber/velocity. There are expanding rifle bullets which will do the job just like for handguns, as well as fragmenting bullets. As previously discussed, the heavier bullets perform better here also. If a bullet fragments, there should be sufficient mass in the largest fragments to ensure penetration to the 12" level for optimum performance. This disqualifies many varmint bullets; while they show dramatic fragmentation, the fragments sometimes penetrate to only 6" or so. This creates impressive surface wounds, but may not penetrate deeply enough.

The 7.62x39 is approximately the equal of a .30-30 rifle cartridge, but there are very few bullet designs which perform adequately unfortunately.

For comparison, here are some pictures of how some military rifle bullets perform in ballistic gelatin:


Military Assault Rifle Wound Profiles
5.45 x 39 mm Russian
53 gr M74 FMJ
at 3066 f/s
5.56 mm M995 52 gr AP
at 3230 f/s
5.56 mm
62 gr M855 FMJ
at 2850 f/s (short NL)
5.56 mm
62 gr M855 FMJ
at 2850 f/s (long NL)
5.56 mm
77 gr Mk262
SMK OTM at 2735 f/s
6.8 x 43 mm SPC
110 gr Horn OTM
at 2600 f/s
7.62 x 39 mm Russian
120.5 gr M43 PS FMJ
at 2300 f/s
7.62 x 39 mm Yugoslav
124 gr M67 FMJ
at 2300 f/s
10
20
30
40
50
60
70
centimeters penetration



In the above diagram, the lines at 20cm and 30cm represent:
20cm (8"): The distance through a human torso in the ideal frontal torso shot.
30cm (12"): The minimum recommended penetration distance

As is readily apparent, FMJ ammunition - in general - is a poor performer. It penetrates deeply, but neither expands nor fragments. The well-documented performance of the M855 as a fragmenting bullet in the diagrams above is an exception; the fragmentation contributes significantly to its performance. Please refer to the Ammo FAQ for further discussion. You will note that M193/M855 are NOT on the recommended list below. If you want to know why, jump ahead to this link.

I'm omitting hunting rifle data, since I assume most people will not bother to use their lever-action rifles in a self-defense situation.

Note about **Barnes** bullets: The TSX is being sold by Barnes as the TAC-X starting in 2009. There are no differences between the TSX and the TAC-X.

.223

While the M855-type ammunition generally meets performance requirements, there have been quite a few reports in inadequate fragmentation. Please remember that this is military ammo, and while the fragmenting properties are well documented and understood, there is no requirement for the bullet to fragment when being tested for acceptance. There can be significant variations in constructions which could make some lots perform much worse than others. For this reason, it is not on the list. While the M193-type ammo is not nearly as complicated of a design, it is also not inherently as devastating as the heavier OTMs listed below. Since this article is about the BEST choices for self-defense ammunition, it is omitted also.

As far as ammunition choices listed below are concerned, keep in mind that some manufacturers might offer the same bullet loaded to .223 chamber pressures and also at 5.56 chamber pressures. The latter allow for approximately 100-200fps more velocity and subsequent better performance. This is the case for the Hornady TAP ammo.

An excellent article written by Molon shows the performance of various types of heavy OTMs, including all the Hornady TAP variations and Mk262 77gr OTM ammunition, velocities, accuracy, etc. It is one of the most comprehensive on the subject I have ever seen and will pretty much tell you anything you need to know. CLICK HERE TO READ THAT ARTICLE.

Included in the article are comparisons of pretty much all components that make up this ammo, including reports of the type of bullet used, the type of powder, primers, velocities through different barrel lengths, accuracy, etc. It also includes pictures of shots into ballistic gelatin of 40/55/75gr TAP, as well as some 77gr loads.

Your rifle's twist rate plays a large part in choosing the right bullet. The most common twist rate is 1:9, and it should (make sure you test it to be sure) stabilize 75gr bullets, and some even work with 77's. 1:7's can use any bullet listed. If you're stuck with 1:12, your choices are narrowed down significantly.

Summarizing Doctor Roberts' choices results in the following list:

If Barrier penetration is NOT an important factor AND your rifle can stabilize them (1:9 minimum twist rate):

Hornady 75gr OTM loads

Nosler 77gr OTM loads

Sierra 77gr SMK loads

If Barrier penetration is NOT an important factor AND your rifle can't stabilize the heavy 70+ grain bullets:

Sierra 69gr SMK loads

Hornady 68gr OTM loads

Winchester 64gr JSP (RA223R2)

Federal 64gr TRU (223L)

Hornady 60gr JSP

If your rifle is 1:12 twist rate and can only shoot lighter-weight bullets:

55gr Federal bonded JSP load (LE223T1 or P223T2)

Barnes 55gr TSX/TAC-X

50gr TSX loaded by Black Hills*****

If Barrier penetration <u>IS</u> an important factor (most of these should work with 1:9 barrels, but use common sense in regards to twist rate requirements)

62gr Federal Trophy Bonded Bear Claw (TBBC) bonded JSP (XM556FBIT3)*****

64gr Winchester solid base bonded JSP (Q3313/RA556B)*****

50gr TSX loaded by Black Hills*****

Speer 55 & 64gr Gold Dot JSP (5.56)*****

Federal 62gr Mk318 Mod0 (T556TNB1)*****

62gr Federal bonded JSP Tactical (LE223T3)

55gr Federal bonded JSP load (Tactical—LE223T1 or identical Premium Rifle—P223T2)

Swift 75gr Scirocco (*usually requires 1:7 twist*)

60gr Nosler Partition JSP

Remington 62gr bonded JSP

Federal 55gr TSX (T223S)

Speer 55 & 64gr Gold Dot JSP (.223)

Federal 62gr Fusion JSP (Same construction as the Gold Dot)

Loads marked with ***** are 5.56 loads and indicate preferred loadings. CLICK HERE FOR GELATIN PERFORMANCE RESULTS OF SOME OF THE AFOREMENTIONED BARRIER LOADS.

If using a short-barreled weapon: The same guidelines apply as for barrier penetration loads. SBRs usually have insufficient velocity to achieve fragmentation velocity.

As per Doctor Roberts: "Keep in mind, that with non-fragmenting bullet designs, heavier bullet weights are not necessarily better, especially at closer ranges and from shorter barrels. As long as penetration and upset remain adequate, it is possible to use lighter weight non-fragmenting bullets and still have outstanding terminal performance. With fragmenting designs, a heavier bullet is ideal, as it provides more potential fragments and still allows the central core to have enough mass for adequate penetration. In addition, heavier bullets may have an advantage at longer ranges due to better BC and less wind drift."

The following pictures show the profiles of several shots into ballistic gelatin:

Sierra 77gr SMK OTM:

Hornady 5.56 TAP (picture by David Fortier):

Hornady 223TAP (Doctor Roberts):

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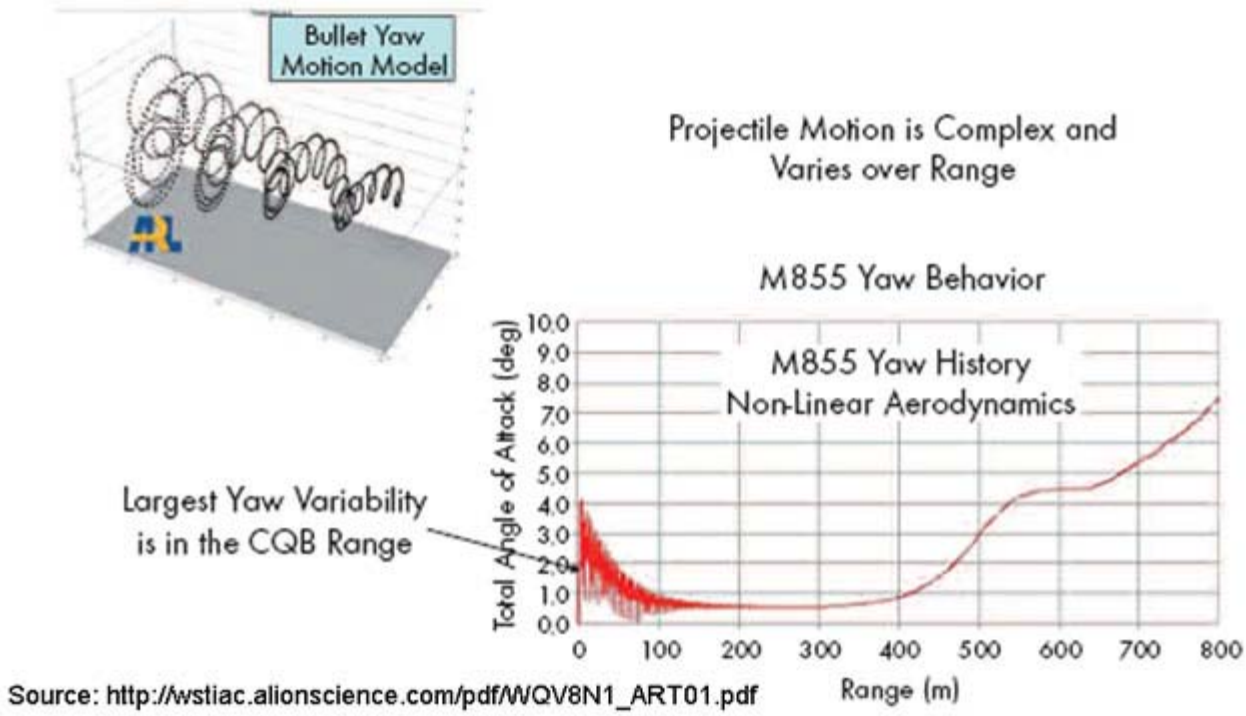
In regards to barrier penetration of the Barnes bullets, keep the following in mind: When the TSX passes through auto windshield glass "the jacket 'petals' fold back against the core, or the 'petals' are torn off; this results in a caliber size projectile configured a lot like a full wadcutter, leading to deep penetration." While acceptable, it does mean that there are better choices. The TSX/TAC-X is a very versatile bullet though, and offer good penetration. THE NEW 50gr TSX APPEARS TO BE AN EXCEPTION.

Also refer to the following posts by brouhaha and tatjana:

1) Multiple round, high velocity 5.56 75 grain Hornady BTHP vs 77 grain Nosler BTHP performance in bare gel.
2) Multiple Round, High Velocity (NATO Pressure) 5.56mm 77 grain OTM (Mk262 Mod 1) performance in bare gel.
3) High Velocity (NATO Pressure) 5.56mm 77 grain OTM performance versus NIJ Level IIIa body armor.

Why not M193/M855?

While these are not bad bullets, you will note that they are subject to large variations in neck length (distance the bullet penetrates before fragmenting); this variability is not desirable. In case of the short neck length, it is indeed an effective bullet. When 855 doesn't begin to fragment until 8"+, it will not be very effective on front torso shots and thin individuals; this explains the dissatisfaction of US combat troops with M855 in some cases. This is due to a phenomenon recently discovered called the "fleet yaw issue". It was first discussed in an article titled Small Caliber Lethality. There is variation from one rifle to the next about how much the bullet will yaw. The bullet leaving one rifle may exhibit more yaw than the same bullet shot from another rifle.



The bullets go through this yaw process on the way to becoming stable, and can yaw by as much as 4 degrees at short distances. You can see in the graph above that the bullet becomes very stable from about 100-400 meters, but the greatest variability - unfortunately - is within CQB range. The angle of attack has a profound impact on how a bullet behaves when striking tissue. Consider the two bullets in the picture below::

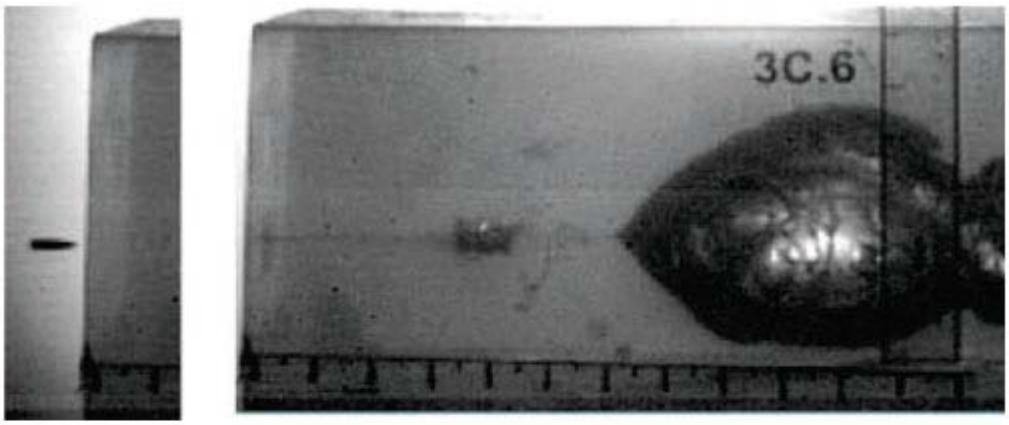


Figure 6. Low Yaw Impact (Source: ARDEC)

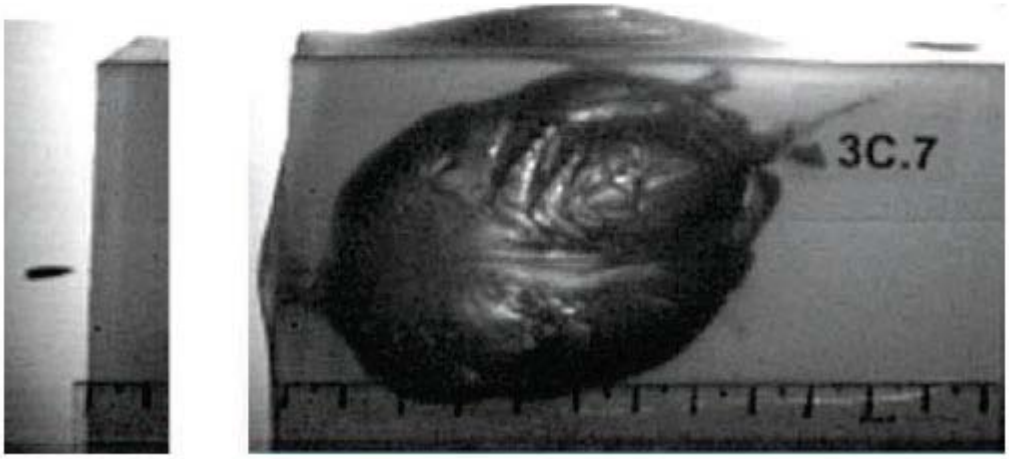
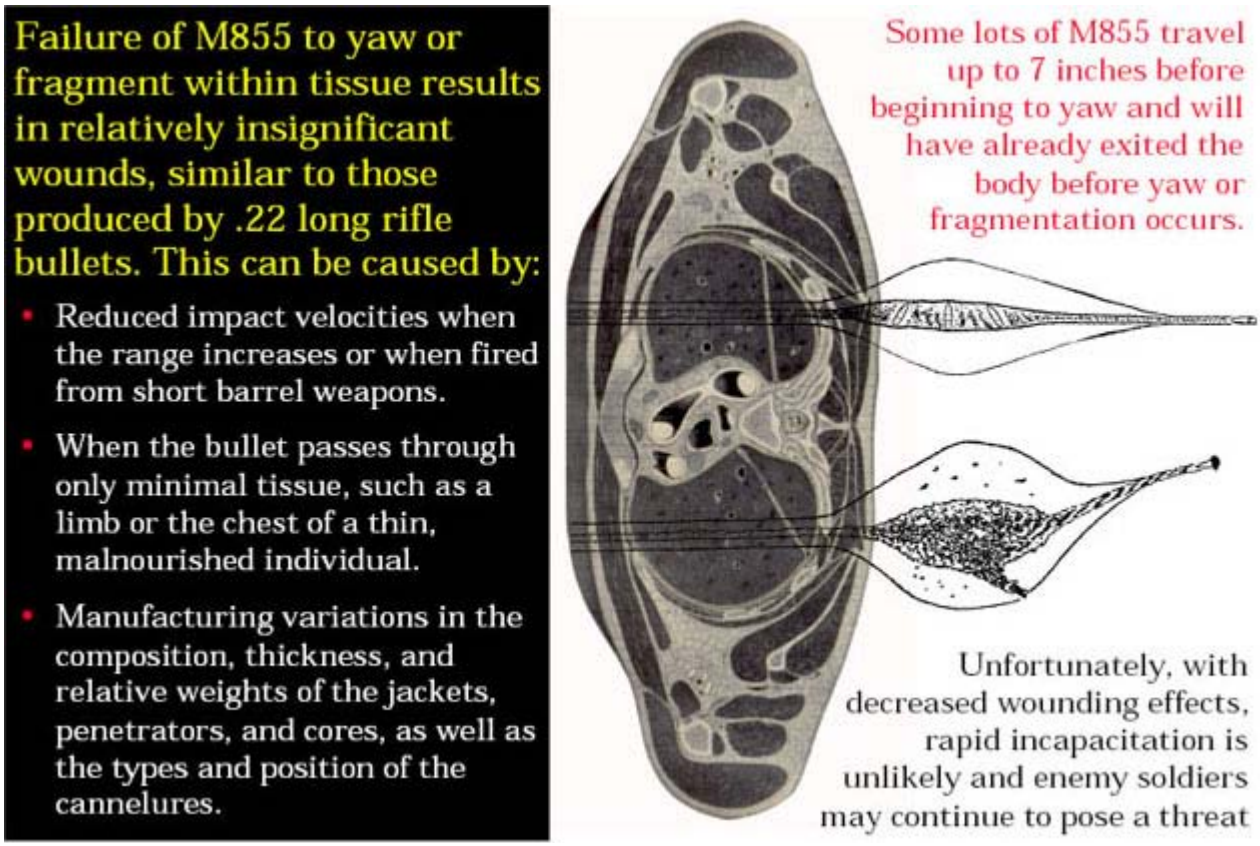


Figure 7. High Yaw Impact (Source: ARDEC)

When you overlay a low-AOA bullet on a human torso, you can see that this might mean the bullet won't begin it's yaw cycle and fragment until after it leaves the body, making a hole not much bigger than a conventional .22LR:



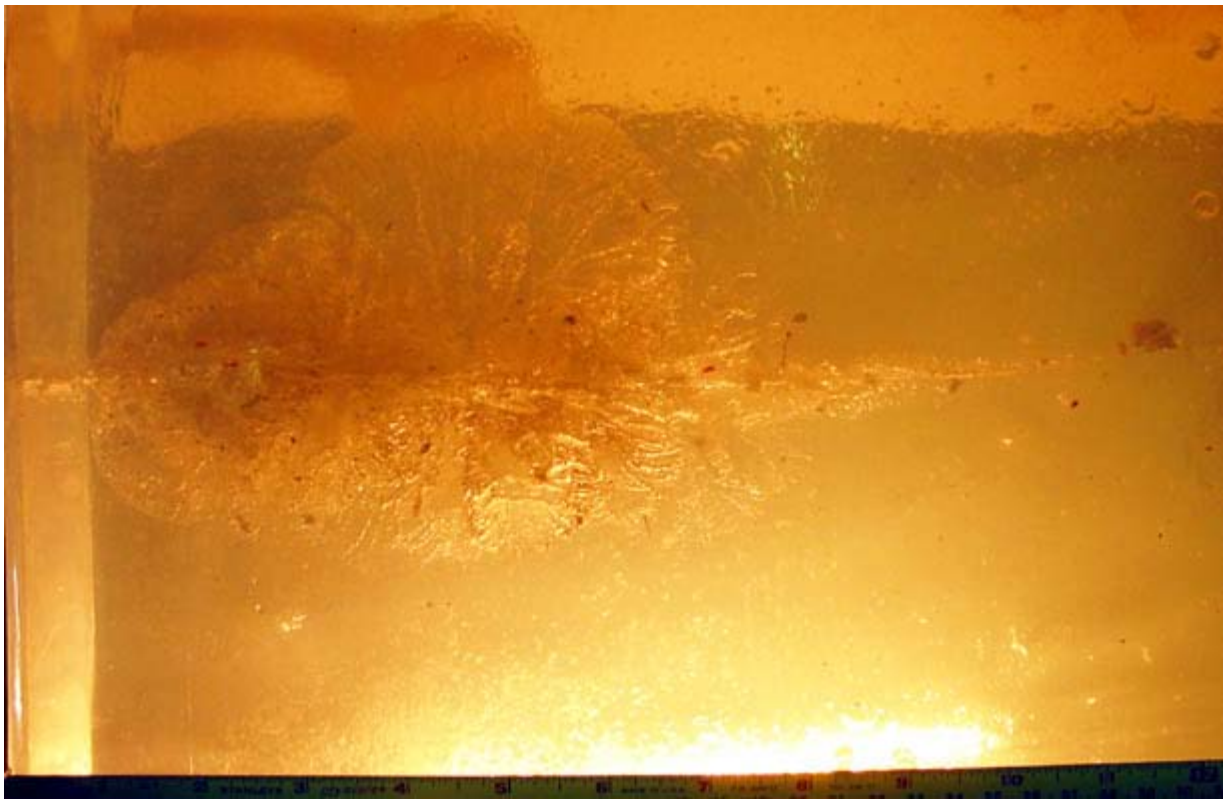
You could engage a target at one distance with a large AOA and great bullet performance, while a few yards more might mean a smaller AOA and poor bullet performance. When M855/193 fragment quickly, they can be very effective. Unfortunately, they could just as easily exhibit poor performance without the end user really knowing how well his particular rifle/ammo performs.

6.8mm SPC

The following data is verbatim from an article by Doctor Roberts on M4Carbine.net:

Barnes 85 and 110 gr TSX JHP -- These all copper, lead free bullets bullets offer good expansion and penetration. They would be useful as both an LE barrier load and for hunting medium game.

Hornady 110 gr VMAX PT -- This is a great fragmenting bullet and is perfect for CQB/LE SWAT entry work; it is also a good choice for light to medium game:

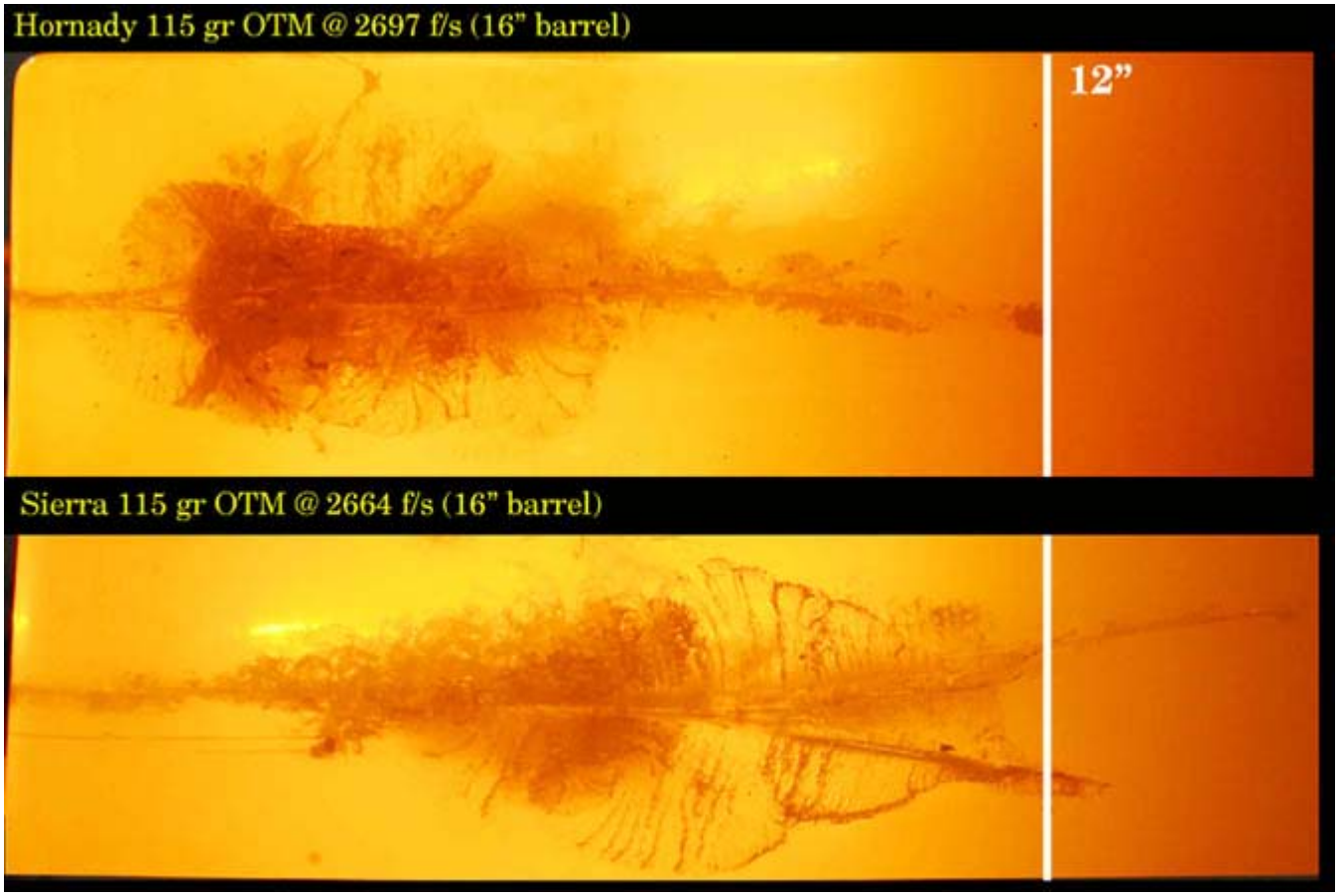


Hornady 110 gr OTM (loaded by Hornady) -- This is a good fragmenting bullet for military use where PT bullets like the AMAX are prohibited, as it offers similar terminal performance to the 110 gr AMAX. It has far better terminal performance than the SMK 115 gr OTM. In addition, it has better glass performance than the 115 gr OTM's.

Hornady 115 gr OTM (loaded by Remington) -- This load has dominated recent military terminal performance testing because of it's early yaw and superb fragmentation, even at reduced impact velocities. It has far better terminal performance than the SMK 115 gr OTM.

Sierra 115 gr OTM (**without** cannelure) -- This first generation SMK is very accurate, but offers somewhat variable terminal performance and is not a great combat, LE, or hunting choice--it is best suited for match target shooting.

Pictures of the preceding two loads in ballistic gelatin:



Sierra 115 gr OTM (**with** cannelure) -- This second generation SMK offers improved feeding reliability and much more consistent terminal performance with early yaw and ideal fragmentation. It is a good choice for military combat and non-barrier LE use.

Remington 115 gr JSP -- Good expansion and penetration make this an excellent choice for law enforcement use through glass and other intermediate barriers, as well as into vehicles. It is also an excellent choice for hunting medium size game.

Sierra 110 gr Pro Hunter JSP -- This is a good bullet for law enforcement use through glass and other intermediate barriers and would be a great load for Highway Patrol and State Police who are working primarily around vehicles. It is also a great hunting load for medium size game.

Just like making sure your AR15 has a true 5.56 mm chamber and proper barrel twist, it is also critical in 6.8 mm to use the original AMU/"Murray" chamber, as well as the superior 3 or 5 groove 1/11 or 1/12 barrel twists--the Remington SAAMI spec chamber is too tight (like a .223 chamber) and the 1/10 6 groove barrels needlessly increase pressures and reduce velocity.

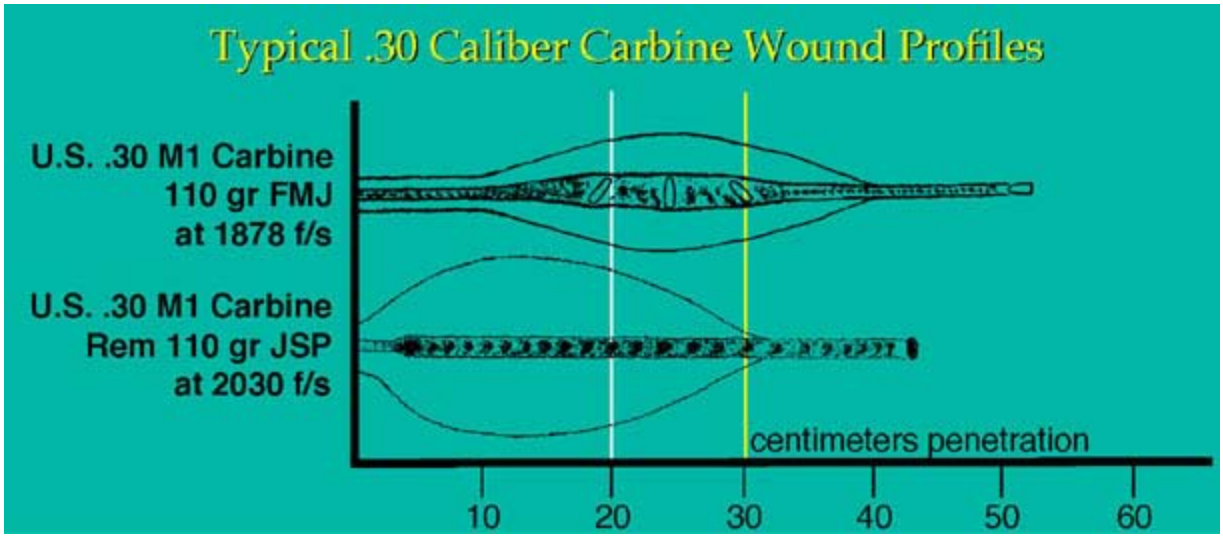
It is very important to keep in mind that the proper 6.8 mm velocity is 2600 fps +/- 50 fps for 110-115 gr projectiles when fired from a 16" barrel. Government organizations who purchase 6.8 mm should

specify in their purchase contracts a minimum acceptable velocity of 2500 fps with an objective velocity of 2600 fps for 16" barrels firing the 110-115 gr projectiles. For duty use, flash suppressed powder, crimped primer, waterproofing, and bullet cannelure should be mandatory requirements.

Also refer to this presentation by Doctor Roberts for the 2008 NDIA symposium.

.30 carbine

From Doctor Roberts: "The best ammunition choices for the M1 Carbine are the Remington 110 gr JSP (R30CAR) and the Corbon 110 gr JHP DPX loading using the all copper Barnes X bullet. The Remington load has an average velocity of 1864 f/s, expands to around .54” to .58” and penetrates 13” to 16” whether in bare gelatin, through automobile windshields, or Level IIIa body armor. This is comparable intermediate barrier performance to many good .223 loads. Likewise, the Corbon DPX load penetrates 18.9" and expands to 0.56" in bare gelatin. The Winchester 110 gr JSP also works reasonably well, but has a bit smaller permanent wound channel compared to the Remington or Corbon DPX load. In addition, the new Speer 110 gr Gold Dot carbine load appears very promising based on the factory test data released at SHOT 2009"



New data shows that the 110gr Speer Gold Dot bonded soft point load is also a very effective performer. Penetration is in the 16-17" range through most of the FBI barrier test with near perfect expansion. Velocity at 10ft averages right at 2000fps.

7.62x39

Lapua 125gr JSP

Winchester Super-X 123 gr Power-Point (X76239)

Both loads show good terminal performance in bare gel and through car windows.

The recent loading of the 124gr Wolf "Military Classic" HP shows promising performance. This ammo is made by Ulyanovsk using their 8M3 bullet, and has been shown to fragment in several tests:
7.62x39mm Sapsan 124 gr JHP (Ulyanovsk Machinery Plant) from 16” AKMS
BG: vel=2297 f/s, pen=15.0”, Max TC=10cm@18cm, RD=0.63”, RW=100.5gr

FORE MORE INFORMATION ON THE WOUNDING EFFECTS OF RUSSIAN RIFLE CALIBERS, PLEASE READ THIS POST.

.308

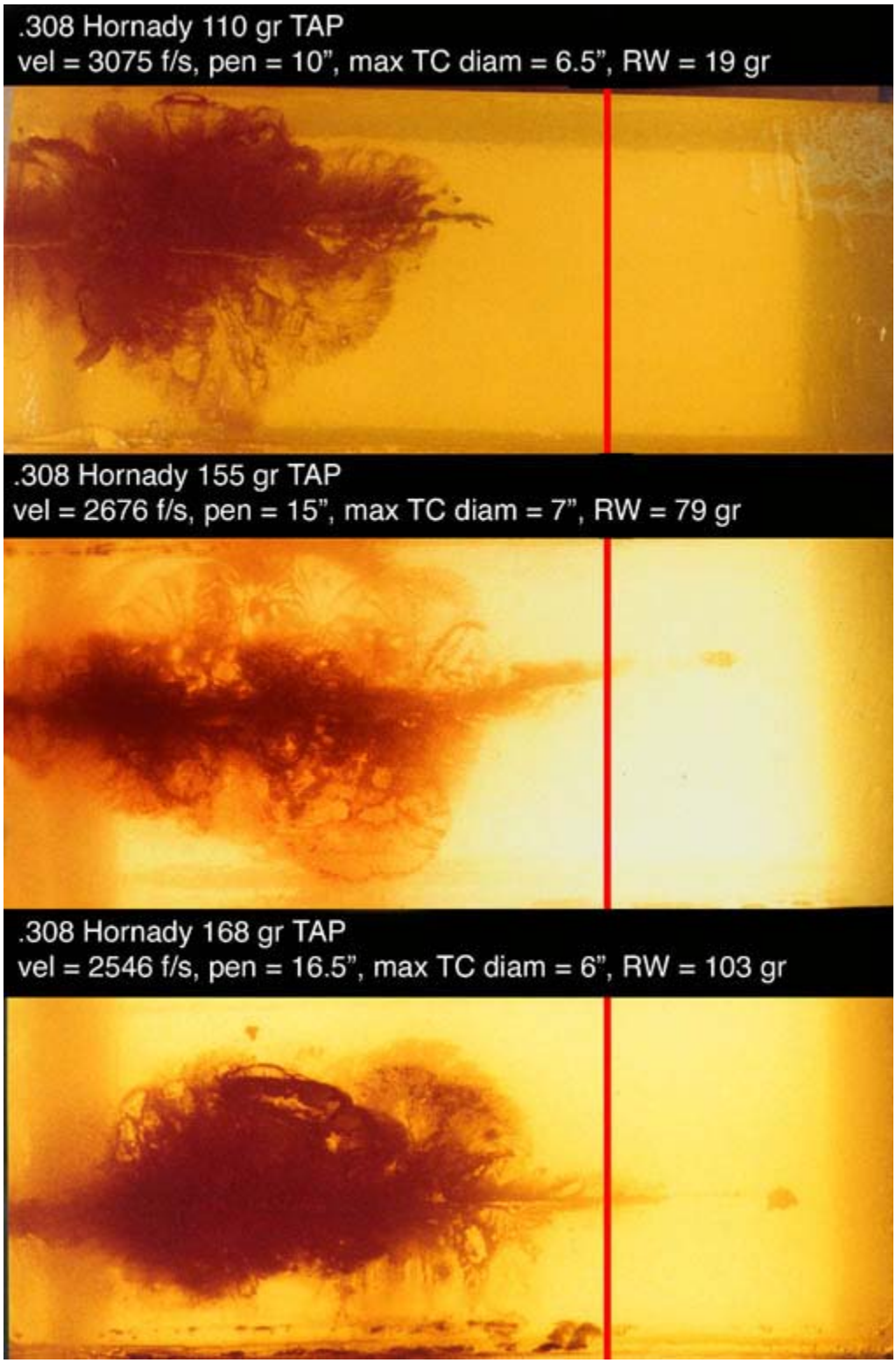
Hornady 155 gr TAP (with AMAX bullet)

Federal 150 gr Nosler Ballistic Tip

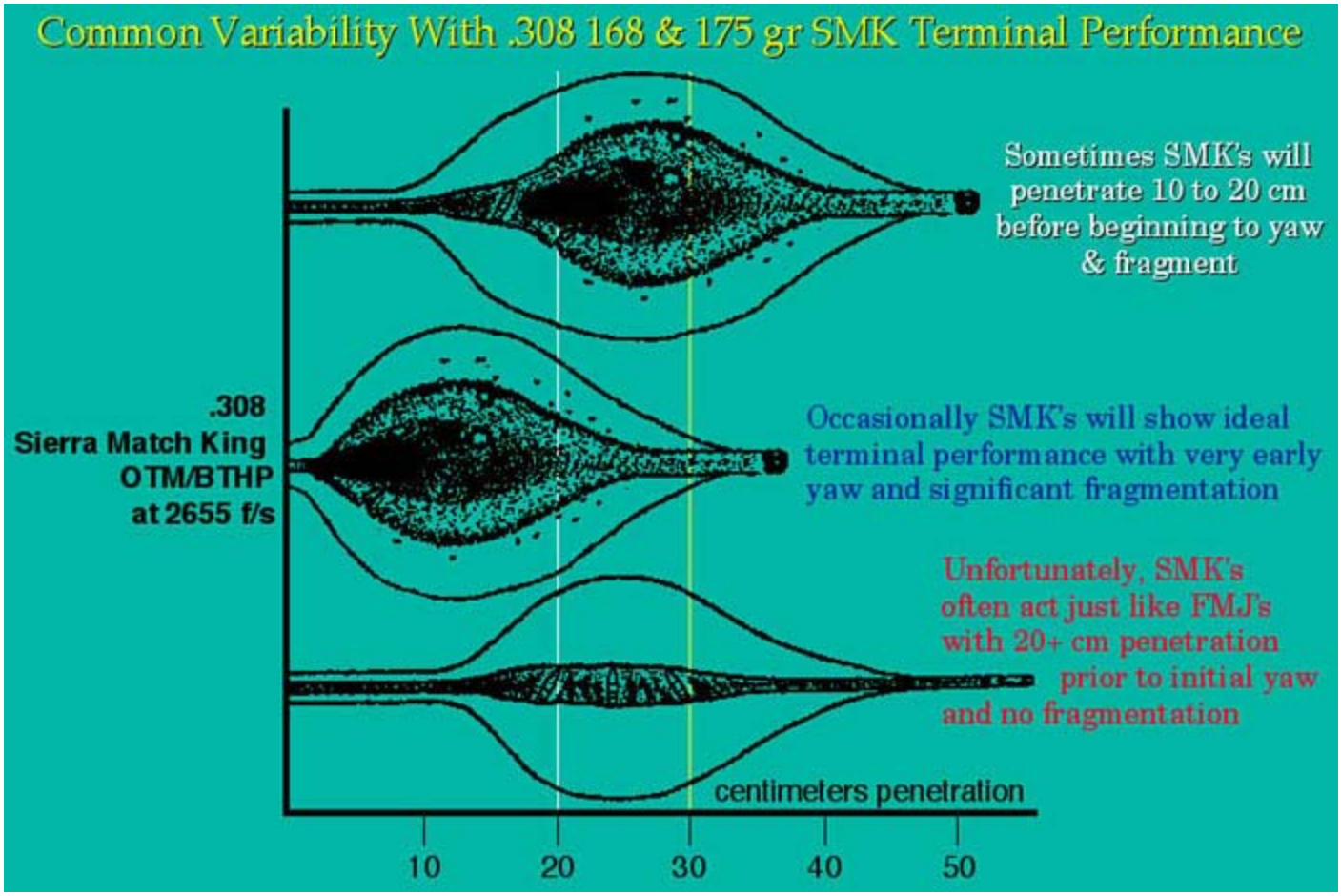
Winchester Supreme 150 gr Ballistic Silvertip

Loads using the 165 gr Sierra Game King

When moving up to the .308, some truly devastating are available and the wound profile is impressive. Notice - once again - the underpenetration of the lightweight bullet in the bunch:



Some of the preferred bullets used by the long-range community are the 168 and 175SMKs. These do not make the best choices for shorter-range shots where instant incapacitation is needed due to the variability in their terminal performance:



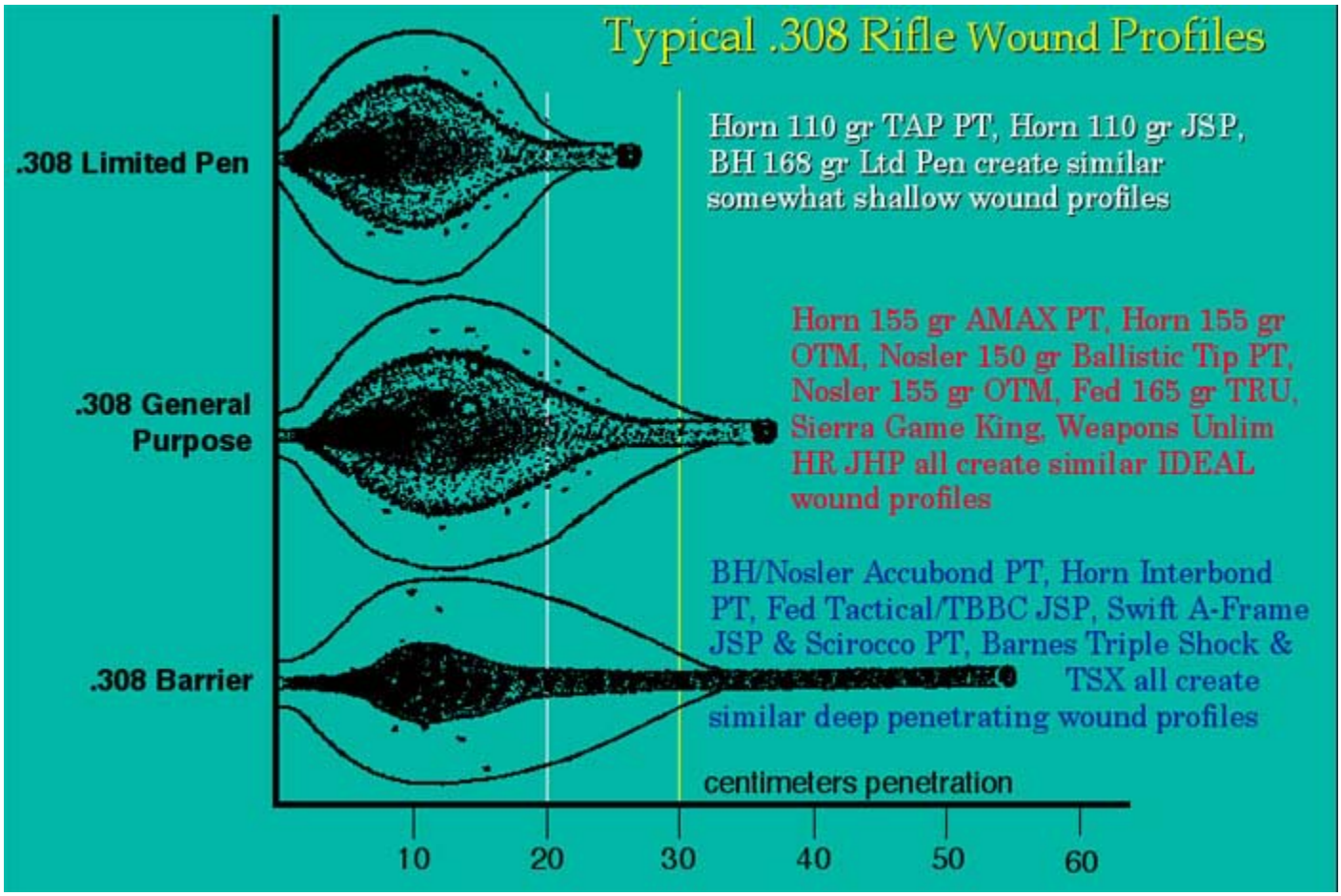
If barrier penetration is needed, the Nosler 180gr Accubond is the best choice, also having superior accuracy. Be aware that this bullet will penetrate through-and-though in almost all cases.

In summary from Doctor Roberts ((source)):

-- For military snipers and others needing long range accuracy, the SMK 175 gr OTM is the way to go.

-- For intermediate barrier penetration, the bonded rounds like the BH loaded Nosler Accubond, Federal loaded TBBC, Hornady Interbond, Swift Scirroco, as well as M993 AP are the best choices.

-- At this time the Hornady 155 TAP offers outstanding accuracy nearly on par with SMK's, as well as more consistent terminal performance, better incapacitation potential and superior performance through glass intermediate barriers than SMK's; as a result, the Hornady 155 gr TAP using the polymer tip AMAX bullet is the probably best general purpose choice for LE snipers. BH also loads AMAX bullets. The Nosler 150 gr Ballistic Tip PT, Hornady and Nosler 155 gr OTM, Federal 165 gr TRU JHP, Sierra Game Kings, and Weapons Unlimited Hostage Rescue JHP also work well.



Rifle data by manufacturer

BACKGROUND DISCUSSION

The source for much of this data comes from the excellent site FirearmsTactical.com. Take some time to dig around their website for more data and background information. **All pictures, unless otherwise specified, belong to Doctor Gary Roberts, DocGKR**.

The important question to be asked, of course, is: What makes a good self-defense load?

The answer to that question is that ammo should meet the FBI's requirement of:
1) at least 12" of penetration in properly prepared ballistic gelatin/soft tissue, and
2) expand to the largest diameter possible in order to cause the largest possible wound.

While some people question the 12" penetration limit, it is not subject to discussion in this article. The FBI is deemed to be more knowledgeable than most, and it is backed up my Dr. Martin Fackler and others who have spent their life discussing the subject. Duncan McPherson, in his book "Bullet Penetration: Modeling the Dynamics and the Incapacitation Resulting from Wound Trauma" actually argues that 15" is not an unrealistic requirement a bullet should obtain. He does point out, however, that 11.5" of penetration shouldn't completely disqualify a bullet from being acceptable either. While 12" should be a minimum requirement, 18" is the approximate maximum desired penetration depth. Beyond that, and the bullet is likely to exit the intended target and retain enough energy to cause others harm if a person should be in the line of fire. **Obviously you should never take the shot if you're not sure of what's beyond your target and rely on your ammunition to do your job of being prudent.**

I will briefly point out that the 12" penetration requirement stems from the fact that not all shots are frontal-torso shots. Many times the bullet must penetrate significantly more tissue, such as when the person being shot has his arms extended in front of him, if the shot is at an oblique angle, etc. You choose ammunition based on a worst-case scenario, not the best.

"But," you say, "there's no way it's THAT important to have a bullet that's only marginally better than my favorite load." That may be well and true. I know you're not planning on missing, and that you figure you'll be able to put a couple of shots center-of-mass with no problems. Don't overestimate your ability when the lead starts flying. There won't be a perfect Weaver stance involved, trigger discipline will go to hell, and carefully aimed shots will be non-existent. How many times have you seen shootouts on "Cops" where they're 2 yards apart, shoot a bunch of times, and yet every shot manages to miss?

Not only that, but hitting the VITAL area of your target is exceedingly difficult. The best case scenario - a full-frontal torso shot - is "easy". The problem is that as the angle of the attacker change, the point of aim has to vary considerably in order to hit the vital structures. For a brief explanation, look at this figure that shows shots that all hit the center of the chest, but none of which bring the bullet path into contact with the vital structures in the thoracic cavity:

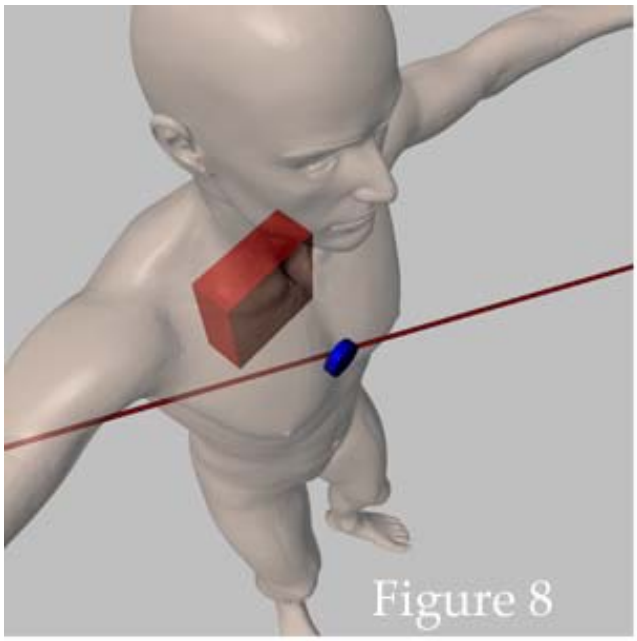


Figure 8

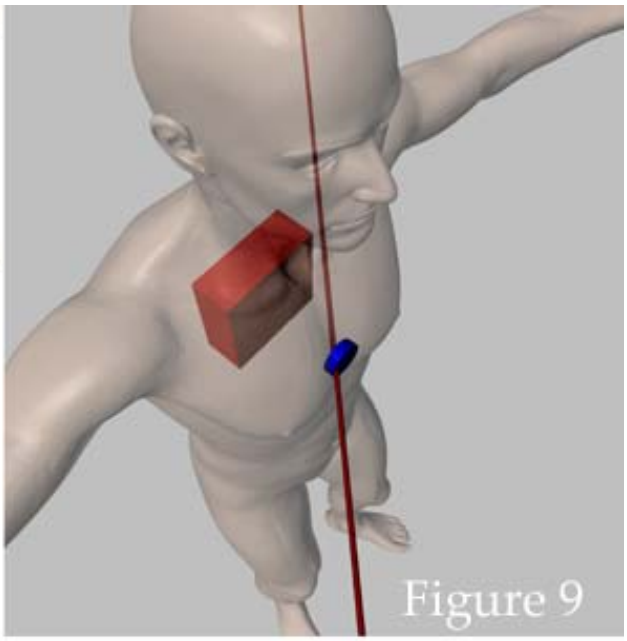


Figure 9

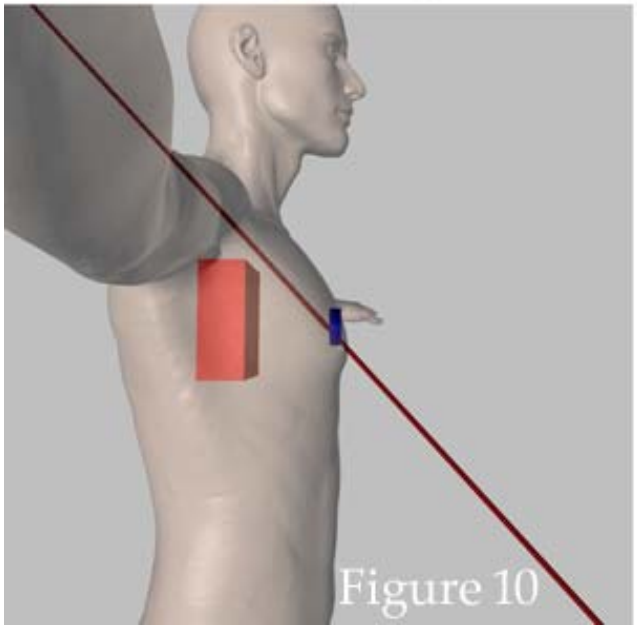


Figure 10

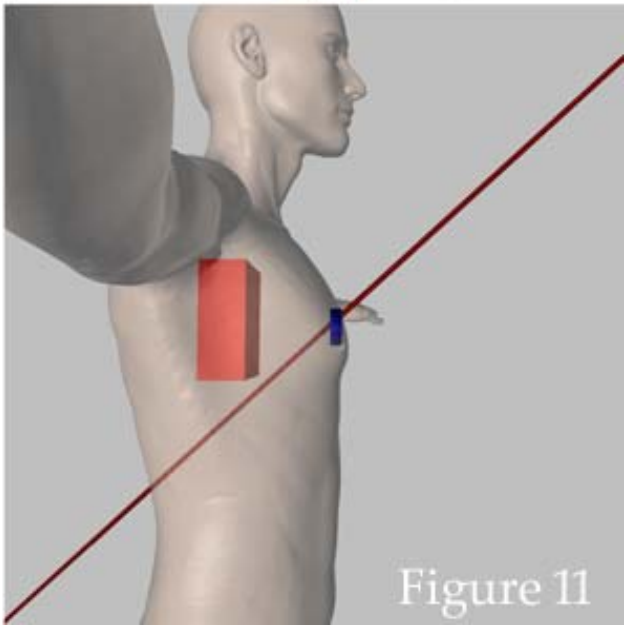


Figure 11

That picture was taken from a thread by **OddJob** (his nick on TacticalForums and The FiringLine). He is a radiographer from South Africa and has written an excellent article on the subject hosted at BrassFetcher.com. Please read that article for more information on the subject.

You plan for a worst case scenario, and that's why it's best to choose a bullet that will put the maximum advantage in your corner.

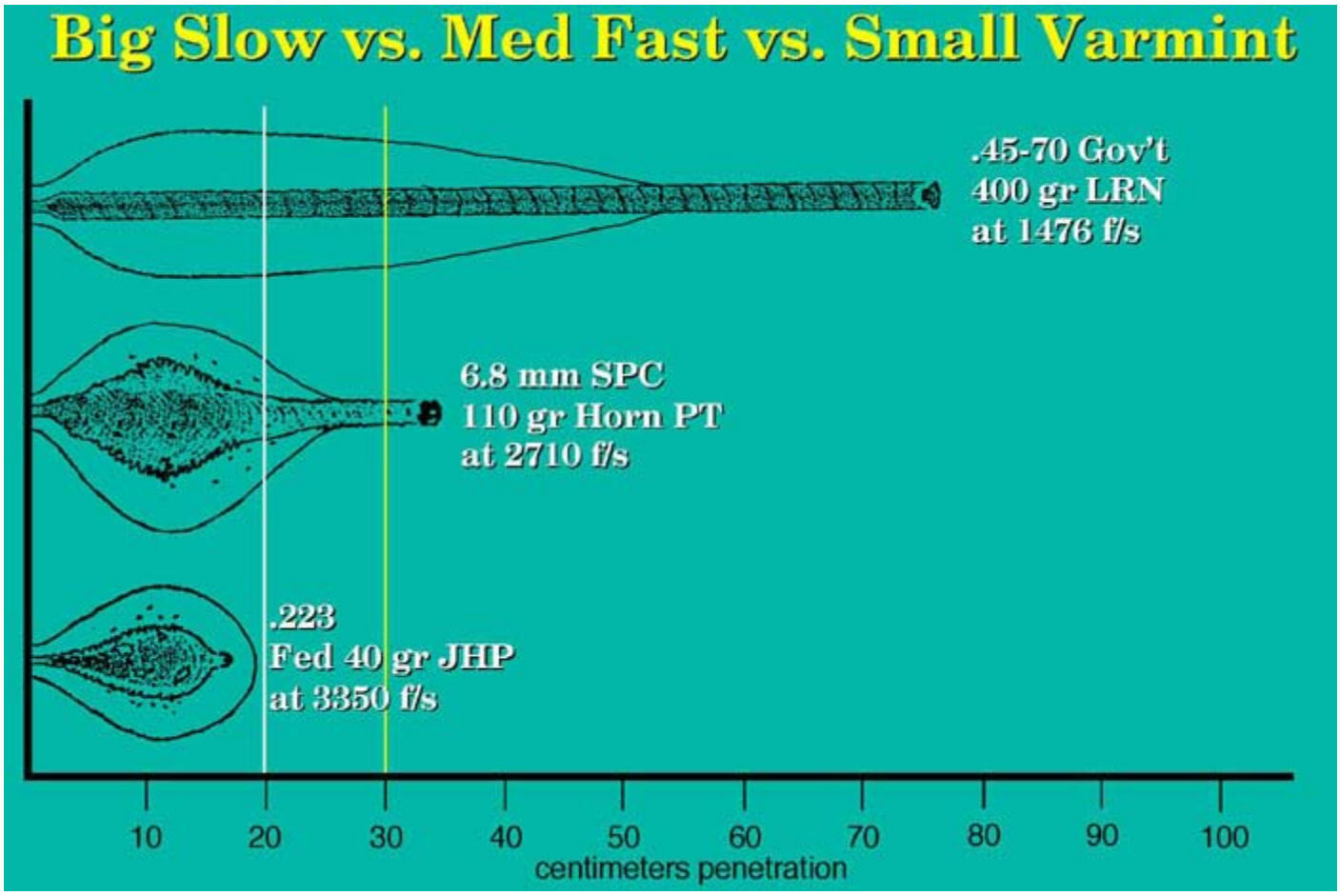
THAT BEING SAID, KEEP IN MIND THAT BULLET PERFORMANCE IS MEASURED IN SHADES OF GRAY, NOT BLACK AND WHITE. THE AMMUNITION RECOMMENDATIONS HERE ARE REPRESENTATIVE OF THE

CURRENT STATE OF THE ART, WHICH DOES NOT MEAN THAT THEY'RE THE ONLY CHOICES - ONLY WHAT IS CURRENTLY DEEMED BEST. You are, of course, free to choose any ammo you want, but there are sound reasons for why some ammo types are recommended over others. These recommendations aren't my own; rather, they have been advanced by the foremost experts in the field. You can choose to disagree with their findings, but don't expect anyone to give you much credence unless you have some serious credentials and proof to back up your claim.

There are several articles written by Dr. Fackler available in the Ammo FAQ, such as The ideal police bullet. As a matter of fact, the article essentially points out exactly what the requirements are and validate the claims that 12" of penetration in conjunction with a large wound channel are what is required of a good bullet.

One of the errors frequently made is to take anecdotal evidence ("I heard this cop shoot someone with such-and-such ammo, and the guy dropped dead on the spot, so this has got to be great ammo.") and apply it across the board for that load. The same thing applies to comments like "he was hit in the center of the chest two times and didn't go down, therefore this load sucks." Please refer to the figures provided earlier that show how center-of-chest hits can miss vital structures of the body easily depending on the angle of the attacker even when hitting the center of the chest. Statistically, it could have been a fluke; only a large sample size will guarantee that the results are repeatable.

An extremely important point to address is the question of velocity. Many people are obsessed with using the highest-velocity ammunition possible. This is a bad choice as penetration is usually DECREASED with increased velocity. Several topics in the FAQ address this issue, but it's important to reiterate that point here. Bullets are designed to perform properly within a certain velocity range. Too low of a velocity will cause the bullet not to expand and can lead to overpenetration. Too high a velocity, and the bullet's additional impact energy will lead to violent expansion and/or fragmentation and result in a large loss of momentum; in these cases, the bullet can actually UNDERPENETRATE. Although the following diagram pertains to rifle bullets, the same holds true for pistols as well (the two vertical lines indicate the approximate thickness of a human torso):



If your bullet isn't listed: While exclusion of a particular ammo may not indicate that it is a poor performer, your best bet is to stick with something on the list. If you have a load which can be shown to meet the proper criteria, IM me and I will include it in the list below. For calibers which aren't listed, your best bet is to look for ammo loaded with a known good performing bullet type in the bullet weight which follows the guidelines established.

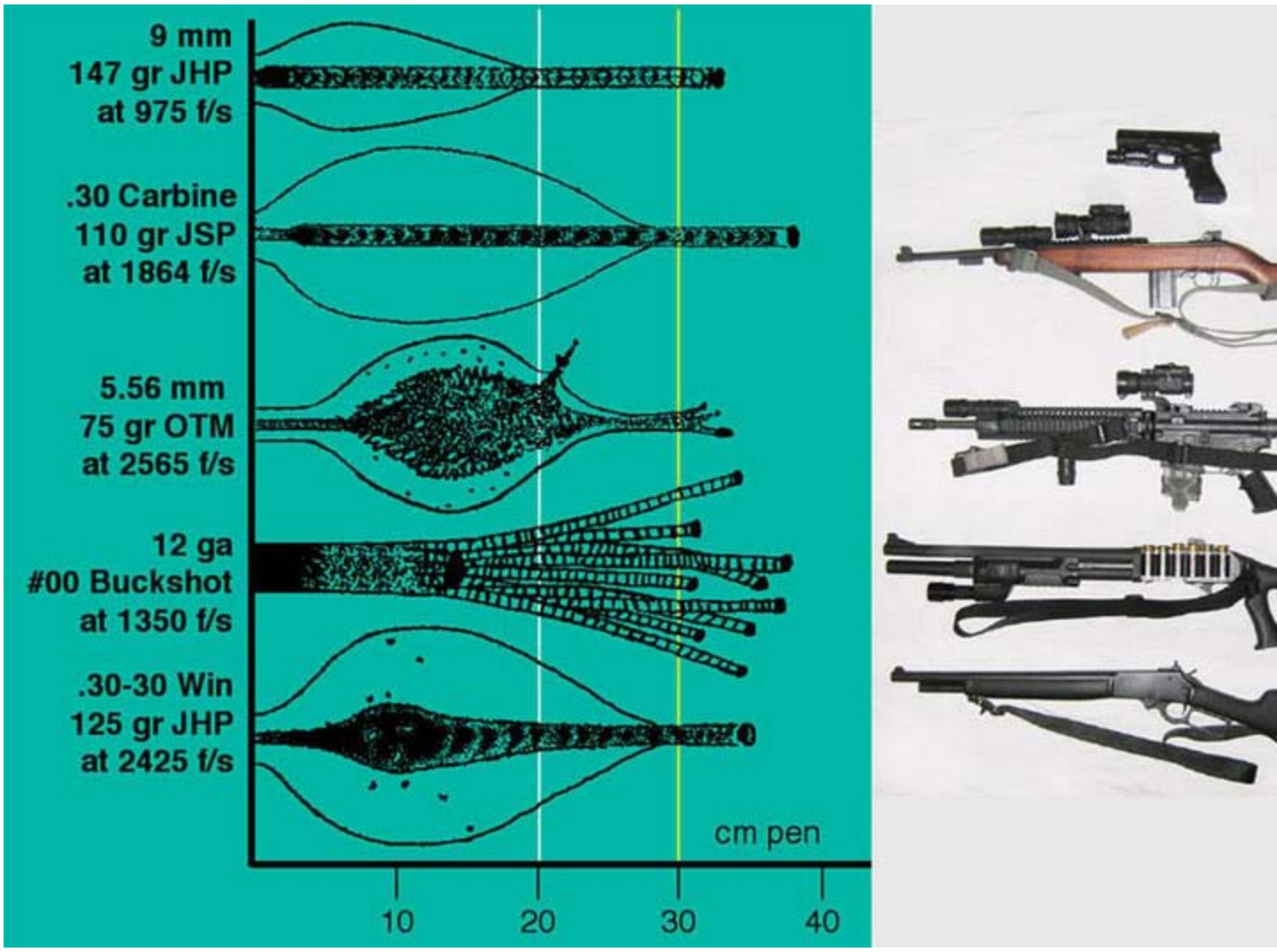
The rest of the article lists loads sorted by caliber which are acceptable to the criteria discussed above. Penetration ability through glass and metal are somewhat deemphasized in this report, as it is not a common requirement for self-defense for civilians. In general, look for bonded-type bullets when barrier penetration is required. These will stay intact after the bullet penetrates the barrier. At the same time, bullets that penetrate through barriers will, by design, also penetrate excessively though common household object. Keep that in mind when selecting a load.

OVERPENETRATION INSIDE THE HOME

A common concern for people when trying to decide which caliber to choose for self defense is overpenetration inside the home. Many believe that pistols calibers would automatically penetrate less than rifle bullets, or that light fragmenting bullets will allow you to not be concerned with

overpenetration. In regards to the latter - this is a false assumption. Take, for example, the Glaser Safety Slug. It is a pre-fragmented bullet with very shallow and completely penetration in bare gelatin. When fired through drywall, the bullet fails to expand and behaves as a FMJ solid. Another example would be using a lightweight varmint bullet in an AR, thinking that the shallow penetration in tissue would be sufficient to not worry about persons in adjacent rooms in case of a miss. The question I would ask is this: If you knew that there is a person in a room behind the bad guy and you're only separated by drywall, would you really risk taking a shot and rely solely on the bullet to not hurt or kill someone in case of a miss?

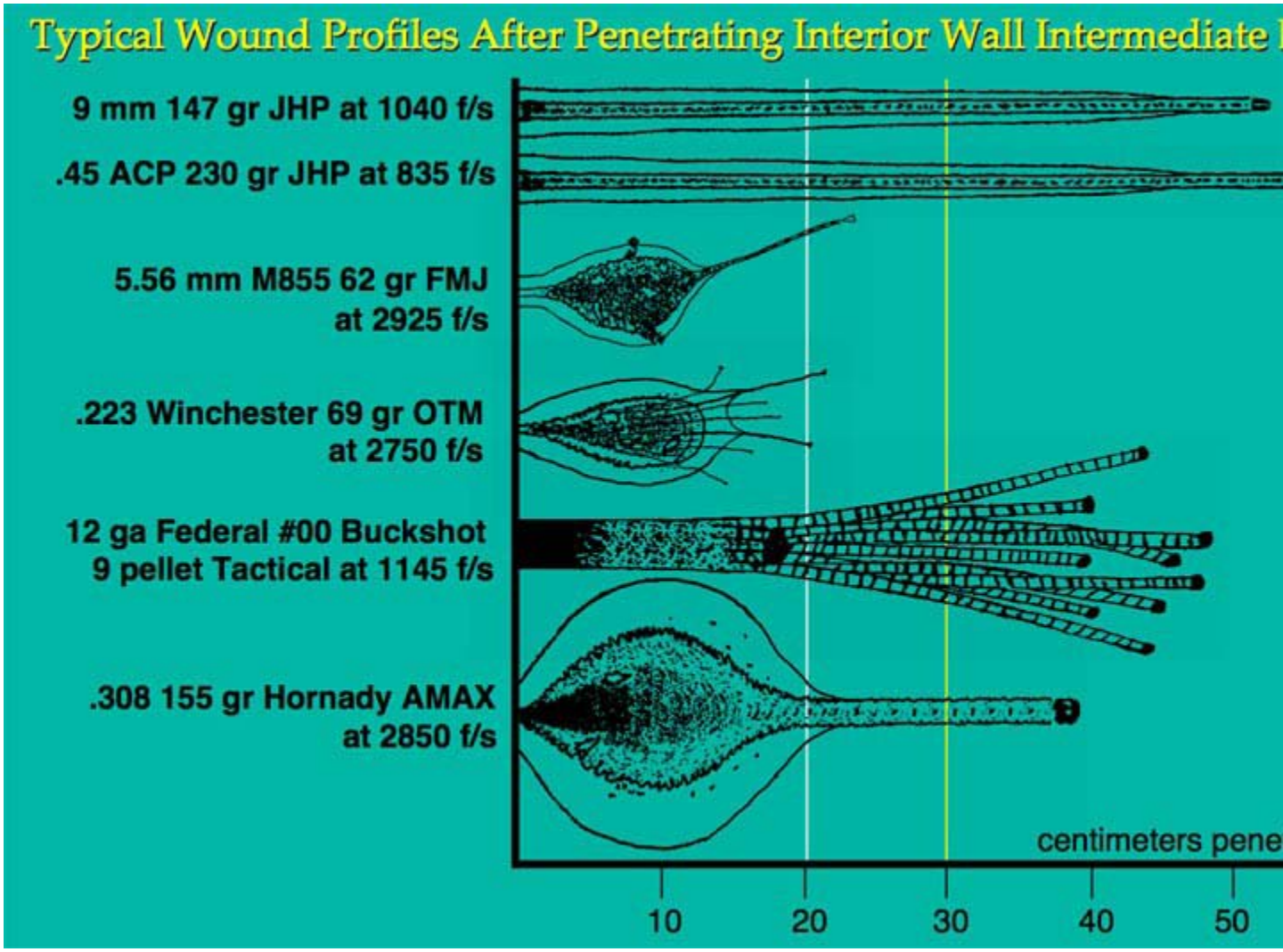
As far as the idea that pistol bullets will inherently penetrate less than rifle cartridges, take a look at this graph comparing common weapons one might employ in the role of self-defense:



Notice that the penetration of all these calibers using high-quality ammunition is approximately the same, quite contrary to common belief. The reason pistol calibers penetrate quite deeply is, as has been mentioned before, the fact that *momentum* is the key factor here. The slower, heavier bullets retain

more momentum and can thus penetrate as much as a bullet launched at much higher velocity. Bullet construction obviously plays a key role as well.

The situation won't change very much if drywall is introduced into the equation:



There is not much that has to be said about this picture; the .223 calibers rapidly lose their momentum after penetrating drywall first, while the heavier bullets do not. Note that the pistol calibers in the example above penetrate to approximately 50cm (~20"). That would lead me to believe that the bullets chosen for that test didn't expand and thus further highlights the need to choose ammunition which passes the FBI test protocols. A Winchester Ranger-T bullet penetrates approximately 15" (~38cm) after encountering wallboard - about the same as the .308 155gr AMAX.

.223

While the M855-type ammunition generally meets performance requirements, there have been quite a few reports in inadequate fragmentation. Please remember that this is military ammo, and while the fragmenting properties are well documented and understood, there is no requirement for the bullet to fragment when being tested for acceptance. There can be significant variations in constructions which could make some lots perform much worse than others. For this reason, it is not on the list. While the M193-type ammo is not nearly as complicated of a design, it is also not inherently as devastating as the heavier OTMs listed below. Since this article is about the BEST choices for self-defense ammunition, it is omitted also.

As far as ammunition choices listed below are concerned, keep in mind that some manufacturers might offer the same bullet loaded to .223 chamber pressures and also at 5.56 chamber pressures. The latter allow for approximately 100-200fps more velocity and subsequent better performance. This is the case for the Hornady TAP ammo.

An excellent article written by Molon shows the performance of various types of heavy OTMs, including all the Hornady TAP variations and Mk262 77gr OTM ammunition, velocities, accuracy, etc. It is one of the most comprehensive on the subject I have ever seen and will pretty much tell you anything you need to know. CLICK HERE TO READ THAT ARTICLE.

Included in the article are comparisons of pretty much all components that make up this ammo, including reports of the type of bullet used, the type of powder, primers, velocities through different barrel lengths, accuracy, etc. It also includes pictures of shots into ballistic gelatin of 40/55/75gr TAP, as well as some 77gr loads.

Your rifle's twist rate plays a large part in choosing the right bullet. The most common twist rate is 1:9, and it should (make sure you test it to be sure) stabilize 75gr bullets, and some even work with 77's. 1:7's can use any bullet listed. If you're stuck with 1:12, your choices are narrowed down significantly.

Summarizing Doctor Roberts' choices results in the following list:

If Barrier penetration is NOT an important factor AND your rifle can stabilize them (1:9 minimum twist rate):

Hornady 75gr OTM loads

Nosler 77gr OTM loads

Sierra 77gr SMK loads

If Barrier penetration is NOT an important factor AND your rifle can't stabilize the heavy 70+ grain bullets:

Sierra 69gr SMK loads

Hornady 68gr OTM loads

Winchester 64gr JSP (RA223R2)

Federal 64gr TRU (223L)

Hornady 60gr JSP

If your rifle is 1:12 twist rate and can only shoot lighter-weight bullets:

55gr Federal bonded JSP load (LE223T1 or P223T2)

Barnes 55gr TSX/TAC-X

50gr TSX loaded by Black Hills*****

If Barrier penetration <u>IS</u> an important factor (most of these should work with 1:9 barrels, but use common sense in regards to twist rate requirements)

62gr Federal Trophy Bonded Bear Claw (TBBC) bonded JSP (XM556FBIT3)*****

64gr Winchester solid base bonded JSP (Q3313/RA556B)*****

50gr TSX loaded by Black Hills*****

Speer 55 & 64gr Gold Dot JSP (5.56)*****

Federal 62gr Mk318 Mod0 (T556TNB1)*****

62gr Federal bonded JSP Tactical (LE223T3)

55gr Federal bonded JSP load (Tactical—LE223T1 or identical Premium Rifle—P223T2)

Swift 75gr Scirocco (*usually requires 1:7 twist*)

60gr Nosler Partition JSP

Remington 62gr bonded JSP

Federal 55gr TSX (T223S)

Speer 55 & 64gr Gold Dot JSP (.223)

Federal 62gr Fusion JSP (Same construction as the Gold Dot)

Loads marked with ***** are 5.56 loads and indicate preferred loadings. CLICK HERE FOR GELATIN PERFORMANCE RESULTS OF SOME OF THE AFOREMENTIONED BARRIER LOADS.

If using a short-barreled weapon: The same guidelines apply as for barrier penetration loads. SBRs usually have insufficient velocity to achieve fragmentation velocity.

As per Doctor Roberts: "Keep in mind, that with non-fragmenting bullet designs, heavier bullet weights are not necessarily better, especially at closer ranges and from shorter barrels. As long as penetration and upset remain adequate, it is possible to use lighter weight non-fragmenting bullets and still have outstanding terminal performance. With fragmenting designs, a heavier bullet is ideal, as it provides more potential fragments and still allows the central core to have enough mass for adequate penetration. In addition, heavier bullets may have an advantage at longer ranges due to better BC and less wind drift."

The following pictures show the profiles of several shots into ballistic gelatin:

Sierra 77gr SMK OTM:

Hornady 5.56 TAP (picture by David Fortier):

Hornady 223TAP (Doctor Roberts):

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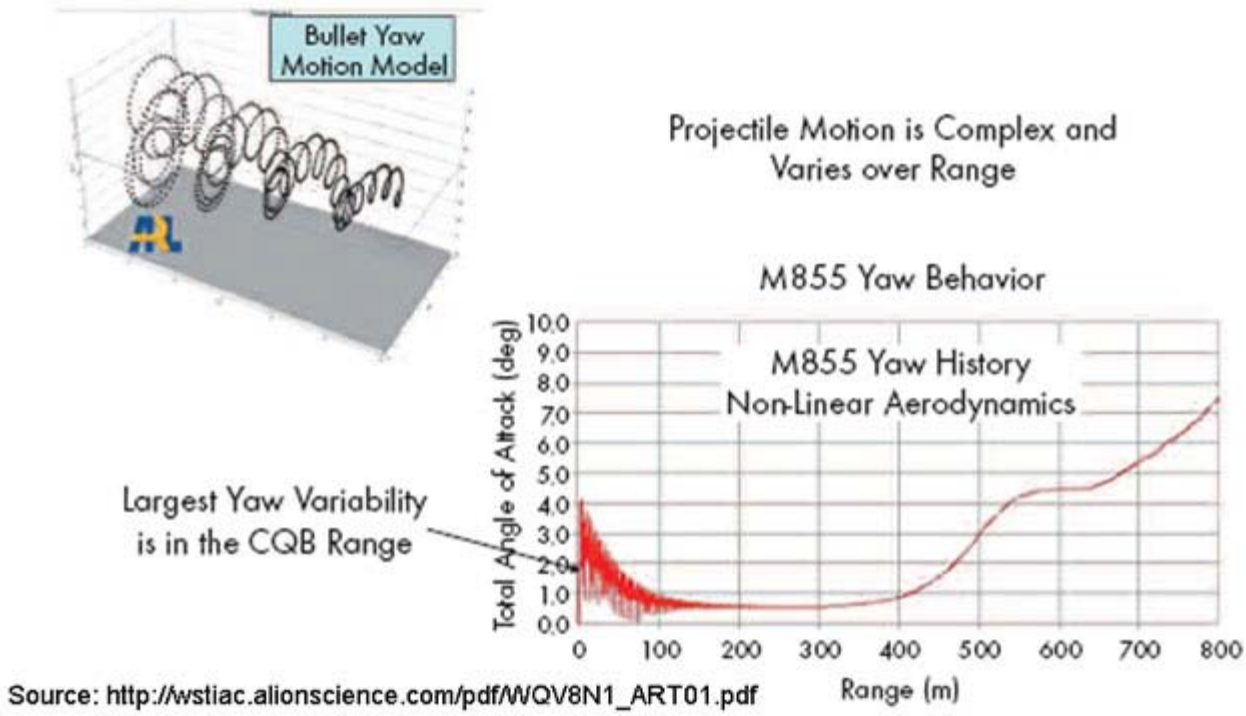
In regards to barrier penetration of the Barnes bullets, keep the following in mind: When the TSX passes through auto windshield glass "the jacket 'petals' fold back against the core, or the 'petals' are torn off; this results in a caliber size projectile configured a lot like a full wadcutter, leading to deep penetration." While acceptable, it does mean that there are better choices. The TSX/TAC-X is a very versatile bullet though, and offer good penetration. THE NEW 50gr TSX APPEARS TO BE AN EXCEPTION.

Also refer to the following posts by brouhaha and tatjana:

1) Multiple round, high velocity 5.56 75 grain Hornady BTHP vs 77 grain Nosler BTHP performance in bare gel.
2) Multiple Round, High Velocity (NATO Pressure) 5.56mm 77 grain OTM (Mk262 Mod 1) performance in bare gel.
3) High Velocity (NATO Pressure) 5.56mm 77 grain OTM performance versus NIJ Level IIIa body armor.

Why not M193/M855?

While these are not bad bullets, you will note that they are subject to large variations in neck length (distance the bullet penetrates before fragmenting); this variability is not desirable. In case of the short neck length, it is indeed an effective bullet. When 855 doesn't begin to fragment until 8"+, it will not be very effective on front torso shots and thin individuals; this explains the dissatisfaction of US combat troops with M855 in some cases. This is due to a phenomenon recently discovered called the "fleet yaw issue". It was first discussed in an article titled Small Caliber Lethality. There is variation from one rifle to the next about how much the bullet will yaw. The bullet leaving one rifle may exhibit more yaw than the same bullet shot from another rifle.



The bullets go through this yaw process on the way to becoming stable, and can yaw by as much as 4 degrees at short distances. You can see in the graph above that the bullet becomes very stable from about 100-400 meters, but the greatest variability - unfortunately - is within CQB range. The angle of attack has a profound impact on how a bullet behaves when striking tissue. Consider the two bullets in the picture below::

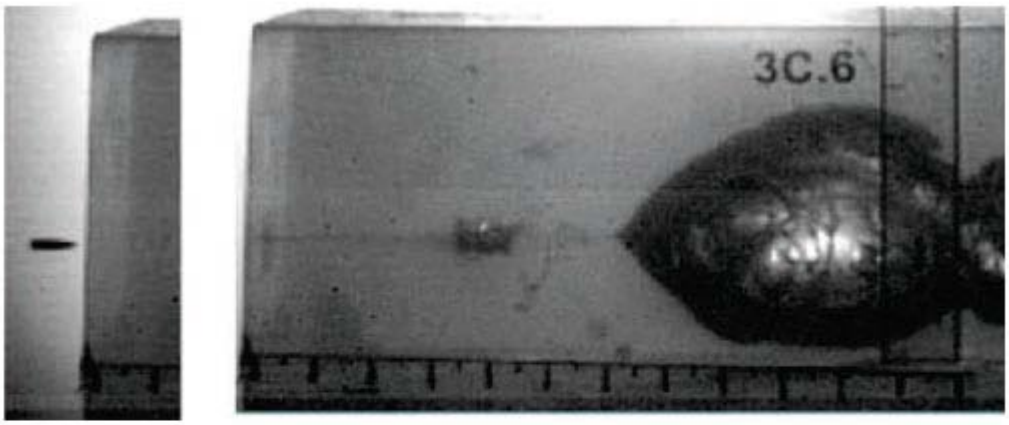


Figure 6. Low Yaw Impact (Source: ARDEC)

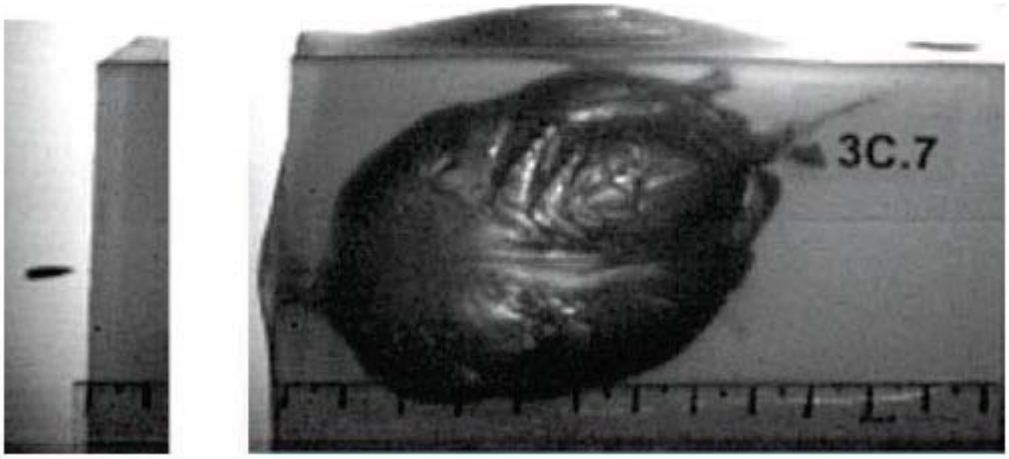
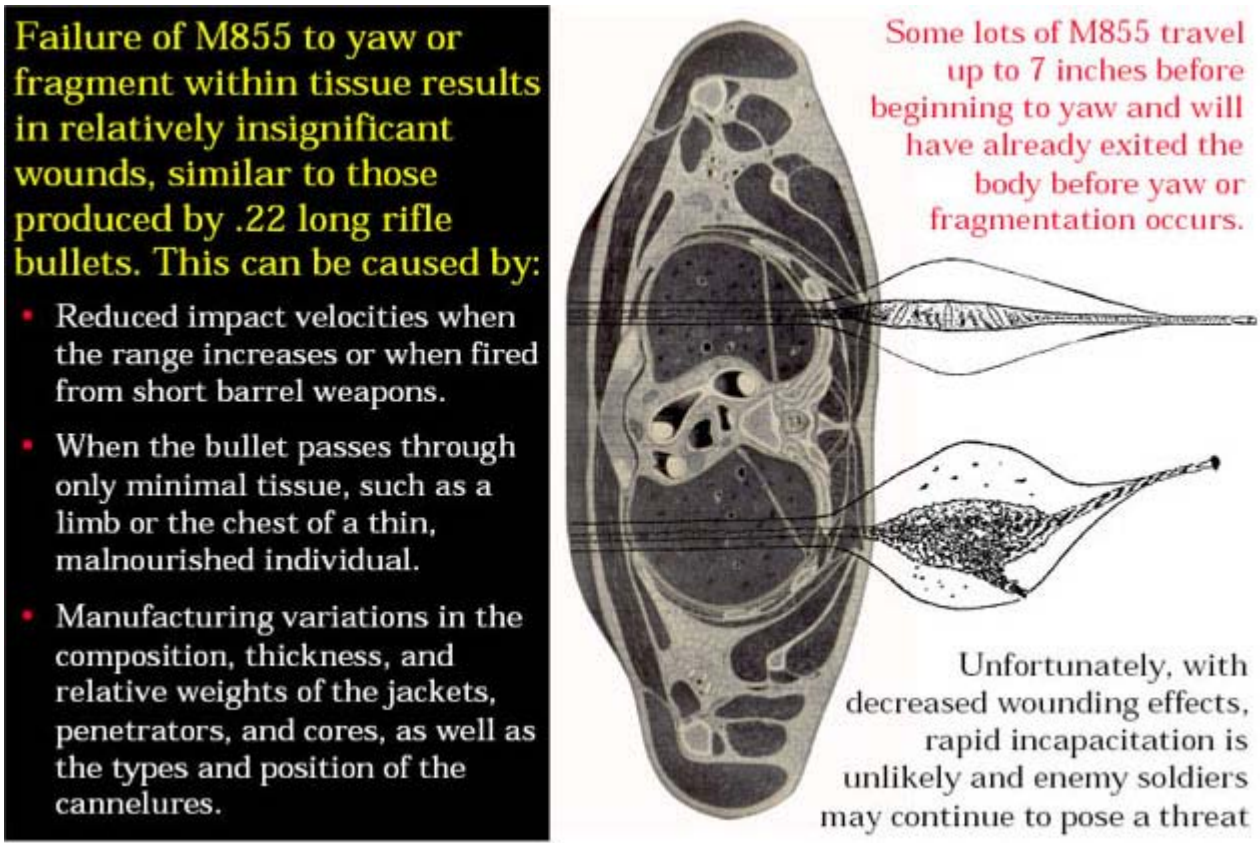


Figure 7. High Yaw Impact (Source: ARDEC)

When you overlay a low-AOA bullet on a human torso, you can see that this might mean the bullet won't begin it's yaw cycle and fragment until after it leaves the body, making a hole not much bigger than a conventional .22LR:



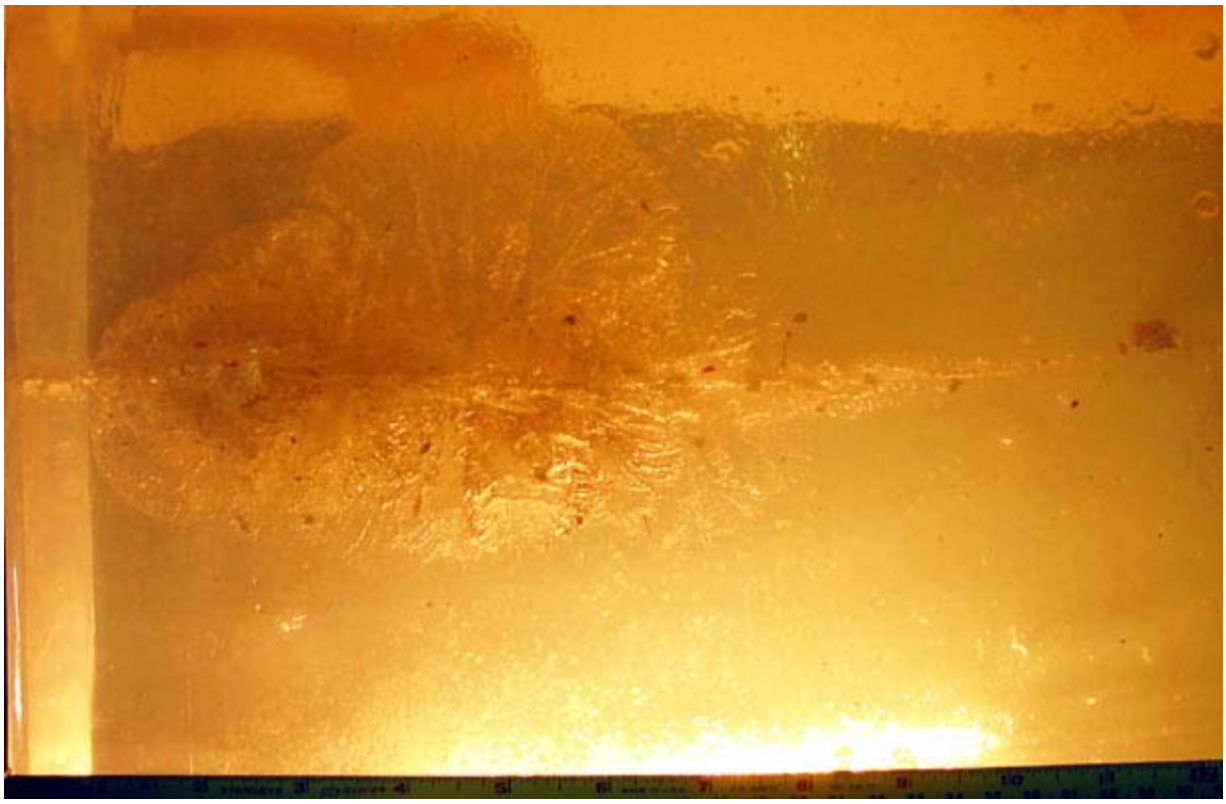
You could engage a target at one distance with a large AOA and great bullet performance, while a few yards more might mean a smaller AOA and poor bullet performance. When M855/193 fragment quickly, they can be very effective. Unfortunately, they could just as easily exhibit poor performance without the end user really knowing how well his particular rifle/ammo performs.

6.8mm SPC

The following data is verbatim from an article by Doctor Roberts on M4Carbine.net:

Barnes 85 and 110 gr TSX JHP -- These all copper, lead free bullets bullets offer good expansion and penetration. They would be useful as both an LE barrier load and for hunting medium game.

Hornady 110 gr VMAX PT -- This is a great fragmenting bullet and is perfect for CQB/LE SWAT entry work; it is also a good choice for light to medium game:

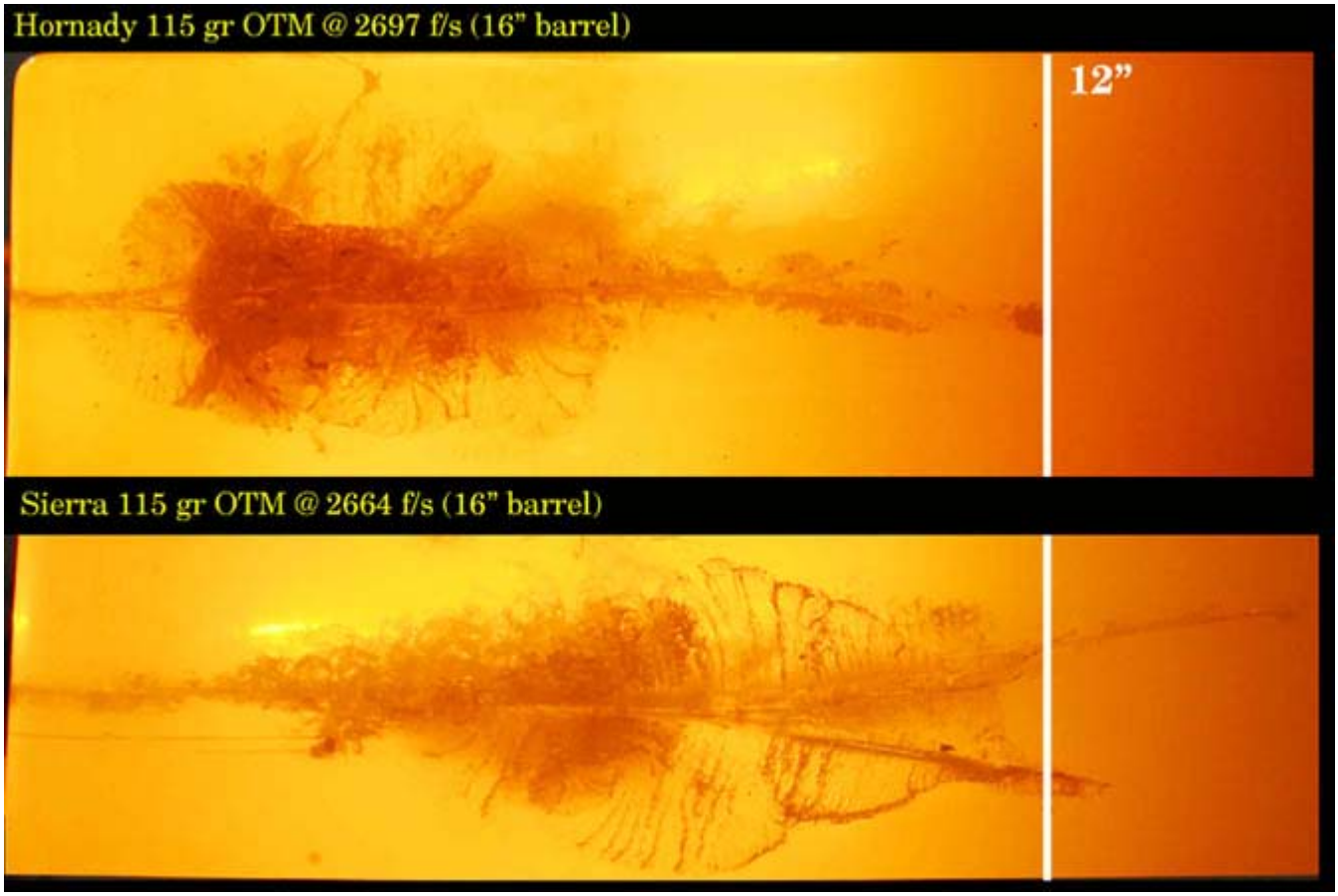


Hornady 110 gr OTM (loaded by Hornady) -- This is a good fragmenting bullet for military use where PT bullets like the AMAX are prohibited, as it offers similar terminal performance to the 110 gr AMAX. It has far better terminal performance than the SMK 115 gr OTM. In addition, it has better glass performance than the 115 gr OTM's.

Hornady 115 gr OTM (loaded by Remington) -- This load has dominated recent military terminal performance testing because of it's early yaw and superb fragmentation, even at reduced impact velocities. It has far better terminal performance than the SMK 115 gr OTM.

Sierra 115 gr OTM (**without** cannelure) -- This first generation SMK is very accurate, but offers somewhat variable terminal performance and is not a great combat, LE, or hunting choice--it is best suited for match target shooting.

Pictures of the preceding two loads in ballistic gelatin:



Sierra 115 gr OTM (**with** cannelure) -- This second generation SMK offers improved feeding reliability and much more consistent terminal performance with early yaw and ideal fragmentation. It is a good choice for military combat and non-barrier LE use.

Remington 115 gr JSP -- Good expansion and penetration make this an excellent choice for law enforcement use through glass and other intermediate barriers, as well as into vehicles. It is also an excellent choice for hunting medium size game.

Sierra 110 gr Pro Hunter JSP -- This is a good bullet for law enforcement use through glass and other intermediate barriers and would be a great load for Highway Patrol and State Police who are working primarily around vehicles. It is also a great hunting load for medium size game.

Just like making sure your AR15 has a true 5.56 mm chamber and proper barrel twist, it is also critical in 6.8 mm to use the original AMU/"Murray" chamber, as well as the superior 3 or 5 groove 1/11 or 1/12 barrel twists--the Remington SAAMI spec chamber is too tight (like a .223 chamber) and the 1/10 6 groove barrels needlessly increase pressures and reduce velocity.

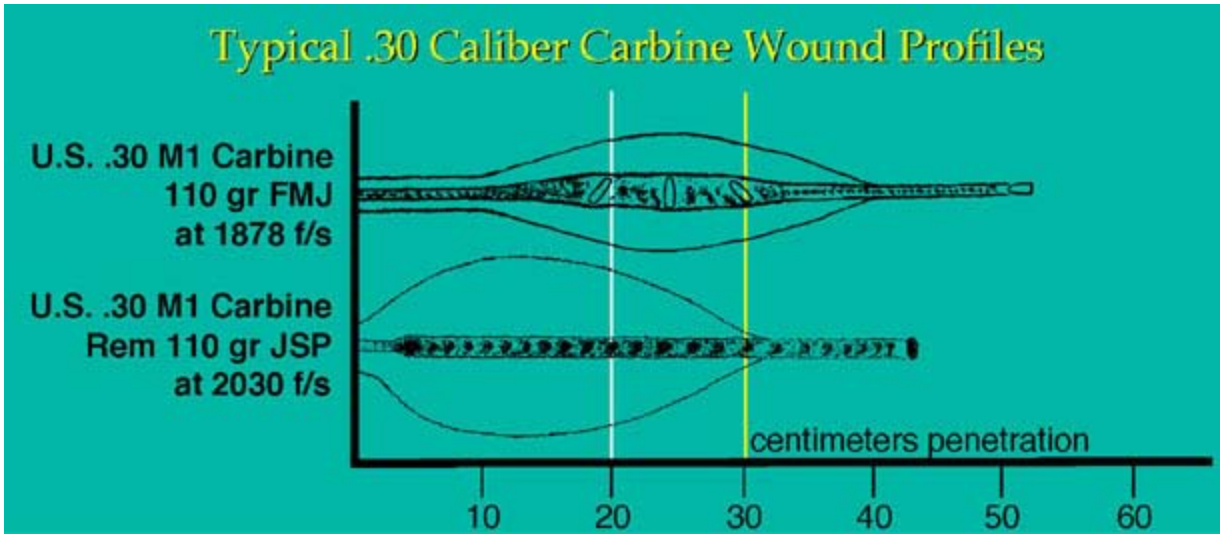
It is very important to keep in mind that the proper 6.8 mm velocity is 2600 fps +/- 50 fps for 110-115 gr projectiles when fired from a 16" barrel. Government organizations who purchase 6.8 mm should

specify in their purchase contracts a minimum acceptable velocity of 2500 fps with an objective velocity of 2600 fps for 16" barrels firing the 110-115 gr projectiles. For duty use, flash suppressed powder, crimped primer, waterproofing, and bullet cannelure should be mandatory requirements.

Also refer to this presentation by Doctor Roberts for the 2008 NDIA symposium.

.30 carbine

From Doctor Roberts: "The best ammunition choices for the M1 Carbine are the Remington 110 gr JSP (R30CAR) and the Corbon 110 gr JHP DPX loading using the all copper Barnes X bullet. The Remington load has an average velocity of 1864 f/s, expands to around .54” to .58” and penetrates 13” to 16” whether in bare gelatin, through automobile windshields, or Level IIIa body armor. This is comparable intermediate barrier performance to many good .223 loads. Likewise, the Corbon DPX load penetrates 18.9" and expands to 0.56" in bare gelatin. The Winchester 110 gr JSP also works reasonably well, but has a bit smaller permanent wound channel compared to the Remington or Corbon DPX load. In addition, the new Speer 110 gr Gold Dot carbine load appears very promising based on the factory test data released at SHOT 2009"



New data shows that the 110gr Speer Gold Dot bonded soft point load is also a very effective performer. Penetration is in the 16-17" range through most of the FBI barrier test with near perfect expansion. Velocity at 10ft averages right at 2000fps.

7.62x39

Lapua 125gr JSP

Winchester Super-X 123 gr Power-Point (X76239)

Both loads show good terminal performance in bare gel and through car windows.

The recent loading of the 124gr Wolf "Military Classic" HP shows promising performance. This ammo is made by Ulyanovsk using their 8M3 bullet, and has been shown to fragment in several tests:
7.62x39mm Sapsan 124 gr JHP (Ulyanovsk Machinery Plant) from 16” AKMS
BG: vel=2297 f/s, pen=15.0”, Max TC=10cm@18cm, RD=0.63”, RW=100.5gr

FORE MORE INFORMATION ON THE WOUNDING EFFECTS OF RUSSIAN RIFLE CALIBERS, PLEASE READ THIS POST.

.308

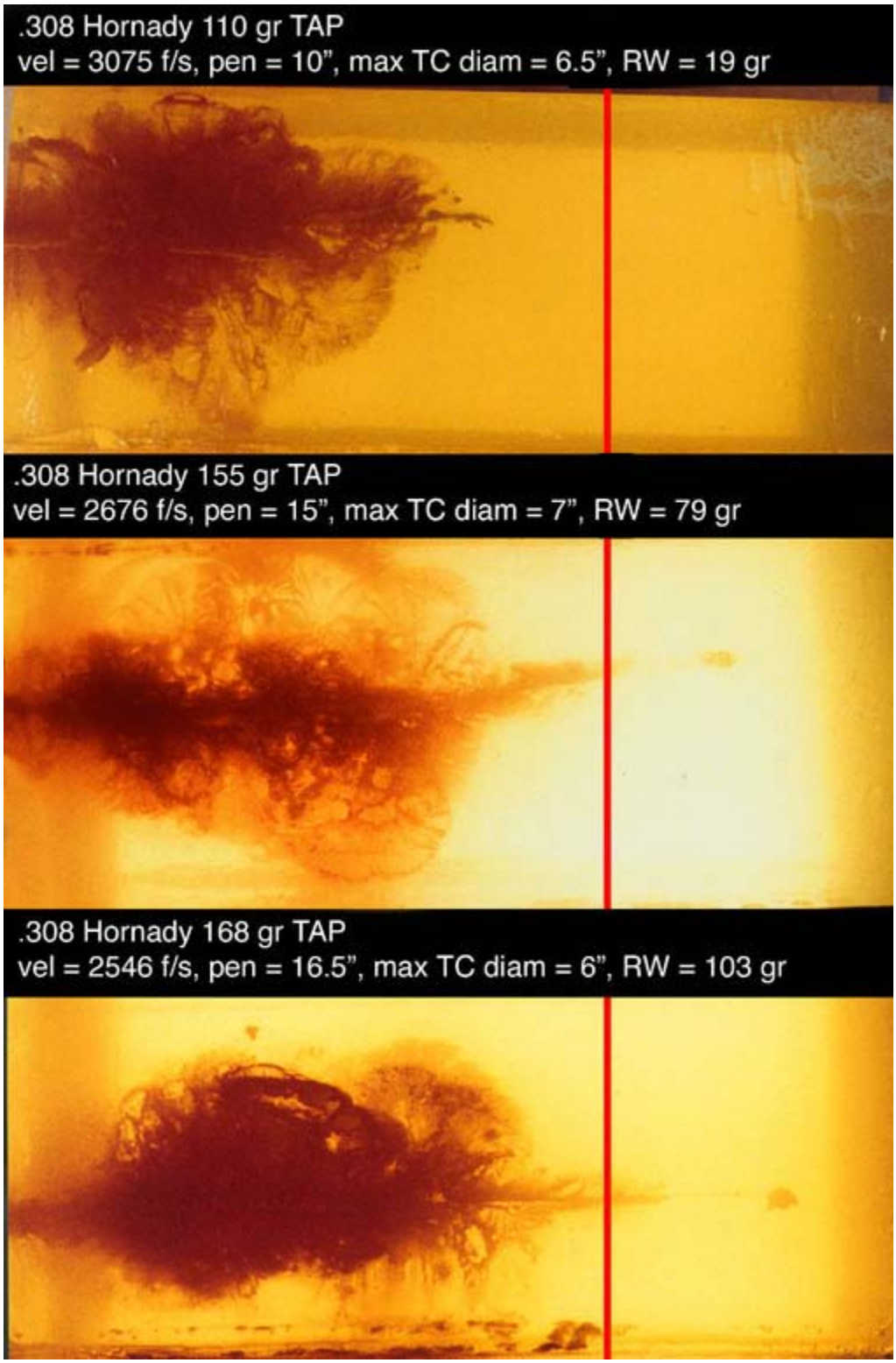
Hornady 155 gr TAP (with AMAX bullet)

Federal 150 gr Nosler Ballistic Tip

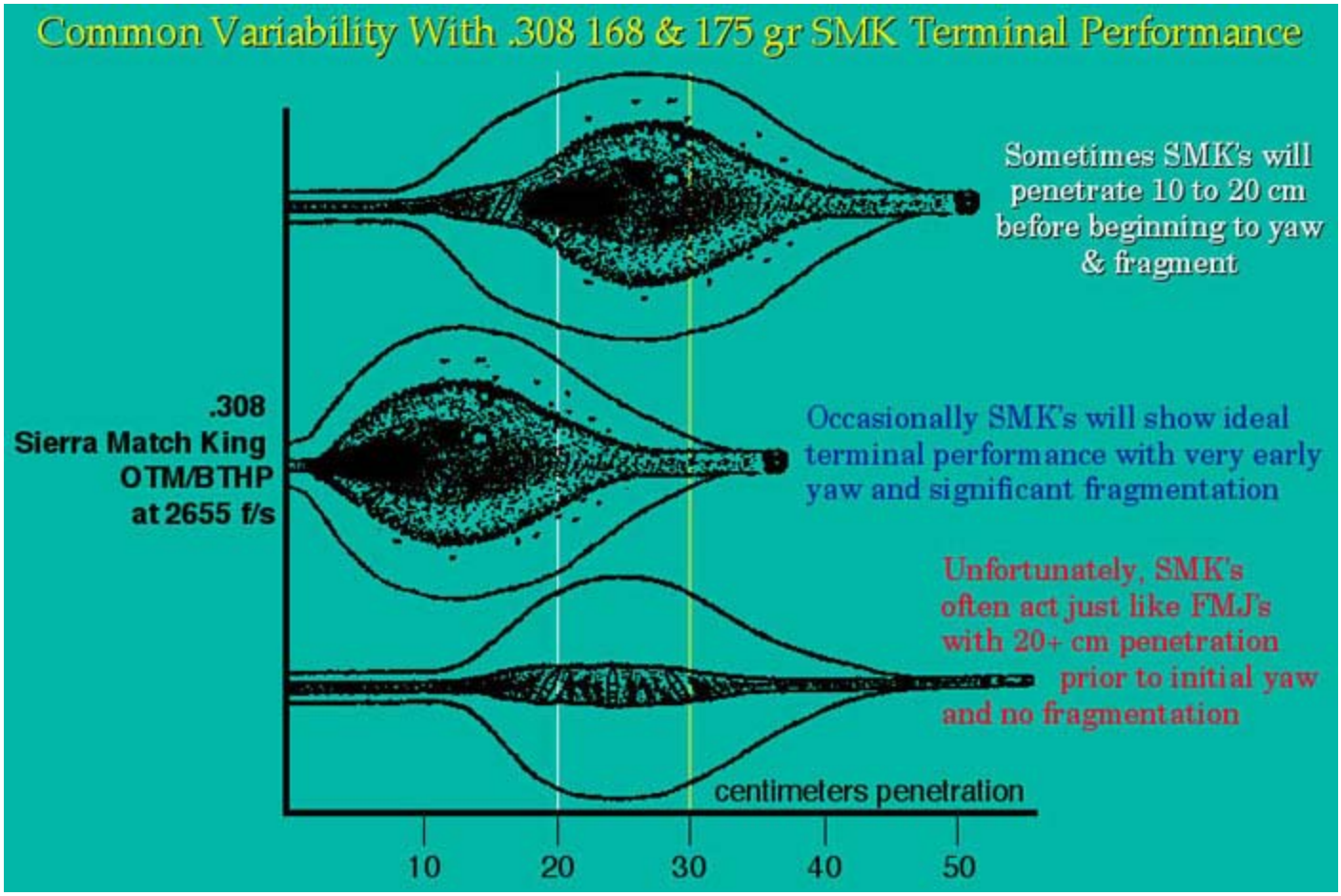
Winchester Supreme 150 gr Ballistic Silvertip

Loads using the 165 gr Sierra Game King

When moving up to the .308, some truly devastating are available and the wound profile is impressive. Notice - once again - the underpenetration of the lightweight bullet in the bunch:



Some of the preferred bullets used by the long-range community are the 168 and 175SMKs. These do not make the best choices for shorter-range shots where instant incapacitation is needed due to the variability in their terminal performance:



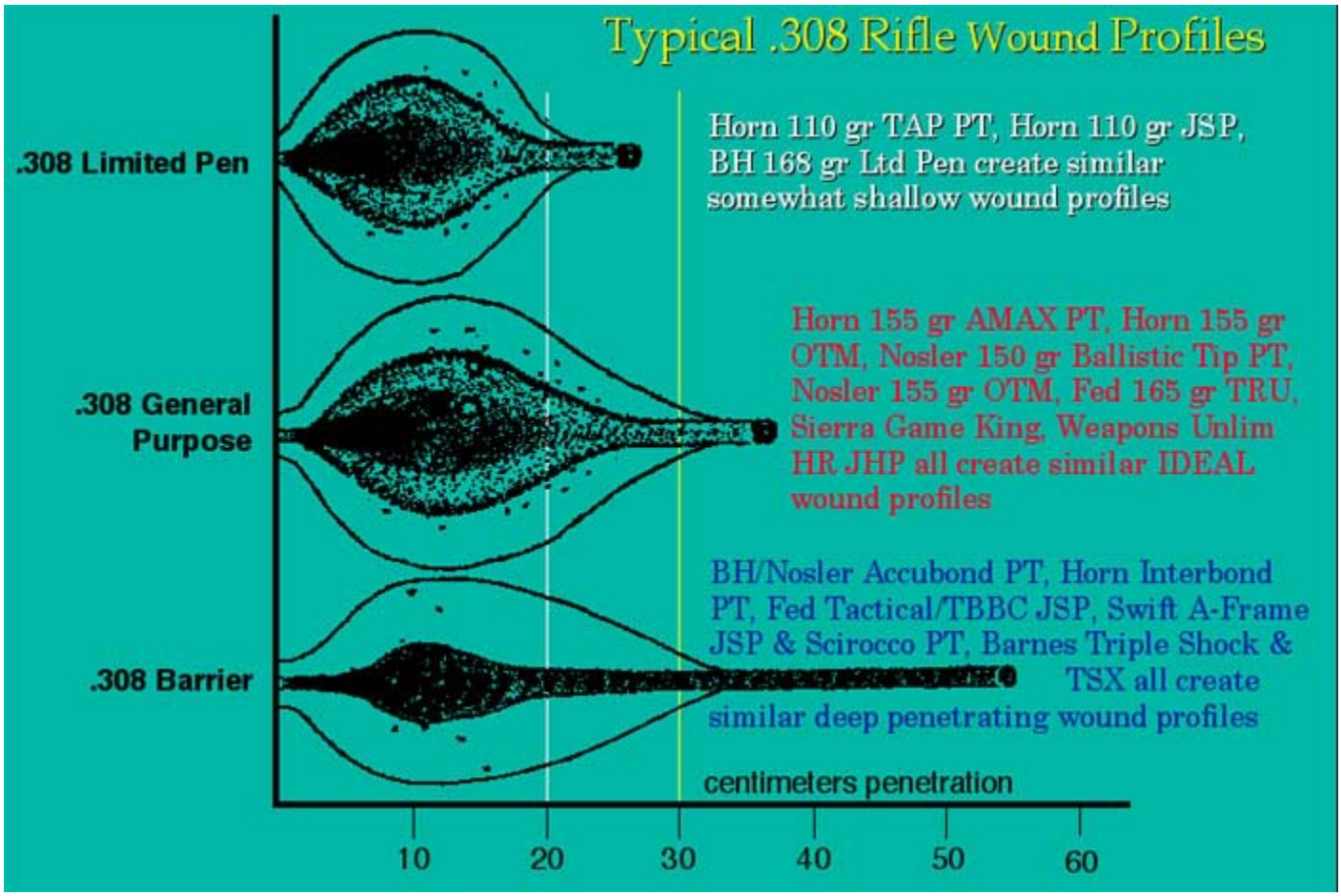
If barrier penetration is needed, the Nosler 180gr Accubond is the best choice, also having superior accuracy. Be aware that this bullet will penetrate through-and-though in almost all cases.

In summary from Doctor Roberts ((source)):

-- For military snipers and others needing long range accuracy, the SMK 175 gr OTM is the way to go.

-- For intermediate barrier penetration, the bonded rounds like the BH loaded Nosler Accubond, Federal loaded TBBC, Hornady Interbond, Swift Scirroco, as well as M993 AP are the best choices.

-- At this time the Hornady 155 TAP offers outstanding accuracy nearly on par with SMK's, as well as more consistent terminal performance, better incapacitation potential and superior performance through glass intermediate barriers than SMK's; as a result, the Hornady 155 gr TAP using the polymer tip AMAX bullet is the probably best general purpose choice for LE snipers. BH also loads AMAX bullets. The Nosler 150 gr Ballistic Tip PT, Hornady and Nosler 155 gr OTM, Federal 165 gr TRU JHP, Sierra Game Kings, and Weapons Unlimited Hostage Rescue JHP also work well.


Typical .308 Rifle Wound Profiles
.308 Limited Pen
Horn 110 gr TAP PT, Horn 110 gr JSP, BH 168 gr Ltd Pen create similar somewhat shallow wound profiles
.308 General Purpose
Horn 155 gr AMAX PT, Horn 155 gr OTM, Nosler 150 gr Ballistic Tip PT, Nosler 155 gr OTM, Fed 165 gr TRU, Sierra Game King, Weapons Unlim HR JHP all create similar IDEAL wound profiles
.308 Barrier
BH/Nosler Accubond PT, Horn Interbond PT, Fed Tactical/TBBC JSP, Swift A-Frame JSP & Scirocco PT, Barnes Triple Shock & TSX all create similar deep penetrating wound profiles
centimeters penetration
10
20
30
40
50
60

Terminal Ballistic Performance of the 5.56mm Cartridge