

**A Technical Discussion of the ELD-X™ (Extremely Low Drag – eXpanding) & ELD™
Match (Extremely Low Drag Match) Bullets with Heat Shield™ Tip**

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Heat Shield Tip™

During the early phases of the development of what would become the ELD-X™ projectiles, Doppler radar testing was done in order to ensure that the design was meeting the aerodynamic design goals for the project. Doppler radar is incredibly useful and effective for analyzing the aerodynamic performance of a projectile. Doppler radar provides velocity, distance and drag data literally every one to two feet of projectile flight. This in turn allows for the calculation of the instantaneous drag on the projectile as it travels downrange. It provides a means to actually see what the projectile is doing as it travels downrange, not just one or two discrete points in space with no idea of what happened in between. The output of this is a curve known as the Drag Coefficient (C_d) versus Mach Number. For practical purposes, Mach 1.0 is approximately 1,100 fps. For simplicity sake, C_d is the exact drag function for that bullet as a function of the bullet's velocity. This allows for a precise study of what is happening to the bullet as it flies downrange.

Figure 1. shows a C_d versus Mach Number graph for a 178 gr BTHP projectile. Particularly notice the slightly concave shape of the curve at higher Mach numbers, above 1.35. This is what a drag curve is expected to look like.

After early testing of prototype bullets it was observed that all currently manufactured tipped projectiles drag curves were convex, not concave and that abnormally low ballistic coefficients were being observed over long ranges. The drag was rapidly increasing at high velocities. (**Note:** The spikey appearance of the curve at low Mach numbers is caused by the weakening signal return as the projectile travels to very long distances from the radar head.)

NOTE: Read C_D vs Mach curve graphs from RIGHT to LEFT – the farthest right reading is where the radar first measured the speed of the projectile.

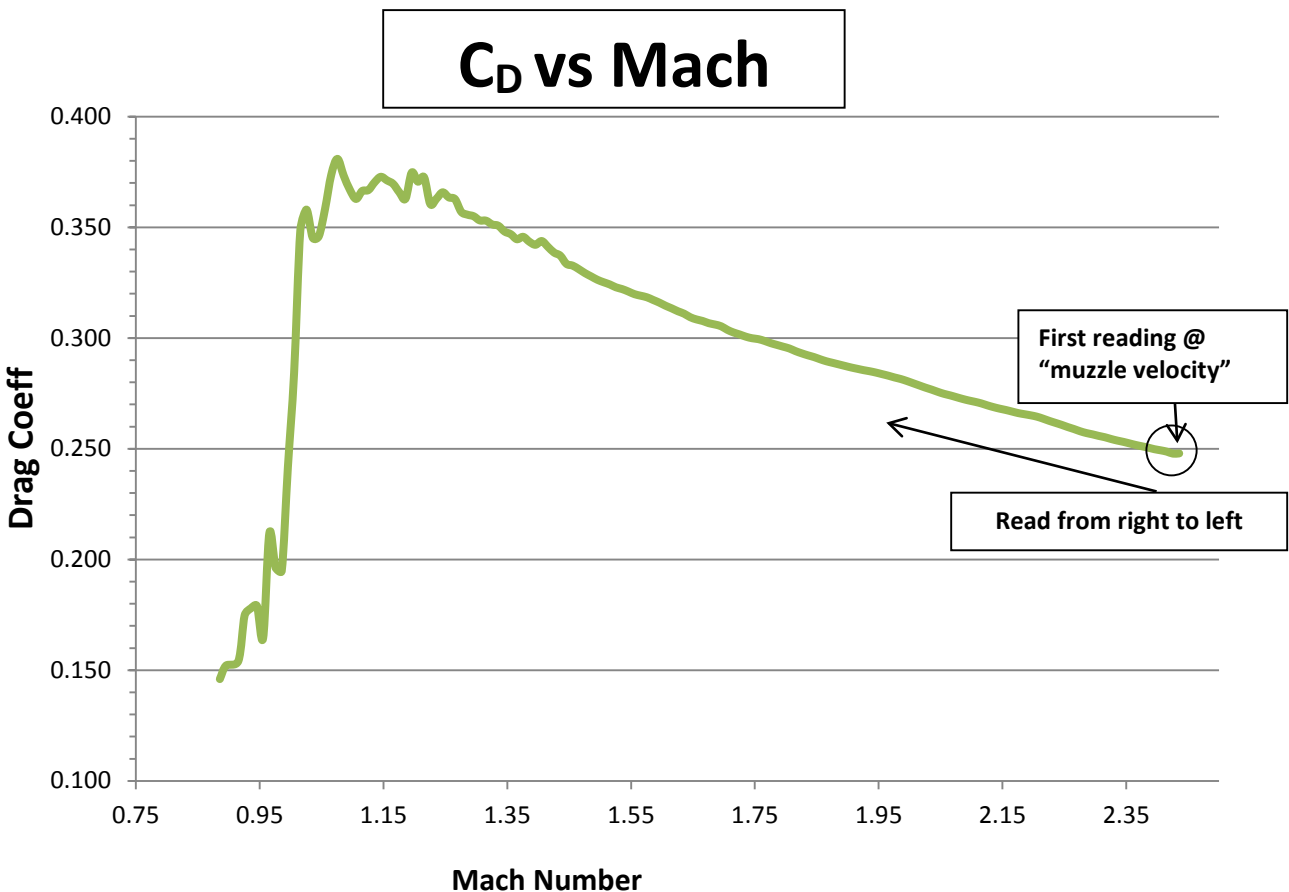


Figure 1. Normal C_d versus Mach Number Curve (slightly concave initially – right side of graph)

Figure 2. is the drag curve of a Hornady 180 grain SST polymer tipped projectile fired on an 80 degree day at 3,000 fps. Notice the sharply convex shape of the drag curve at high and mid-range Mach Numbers. The drag of the projectile is rapidly increasing at high Mach numbers and remaining at higher than normal levels for nearly the entire flight. This showed unexpected projectile drag performance.

At this point extensive testing was done with all types of commercially available tipped projectiles. **They all exhibited this behavior to a greater or lesser extent depending on their ballistic coefficient and launch velocity.** Most projectiles exhibited BC's relatively close to published values for 150 to 200 yards of flight. Beyond these distances they all showed BC's substantially below published values.

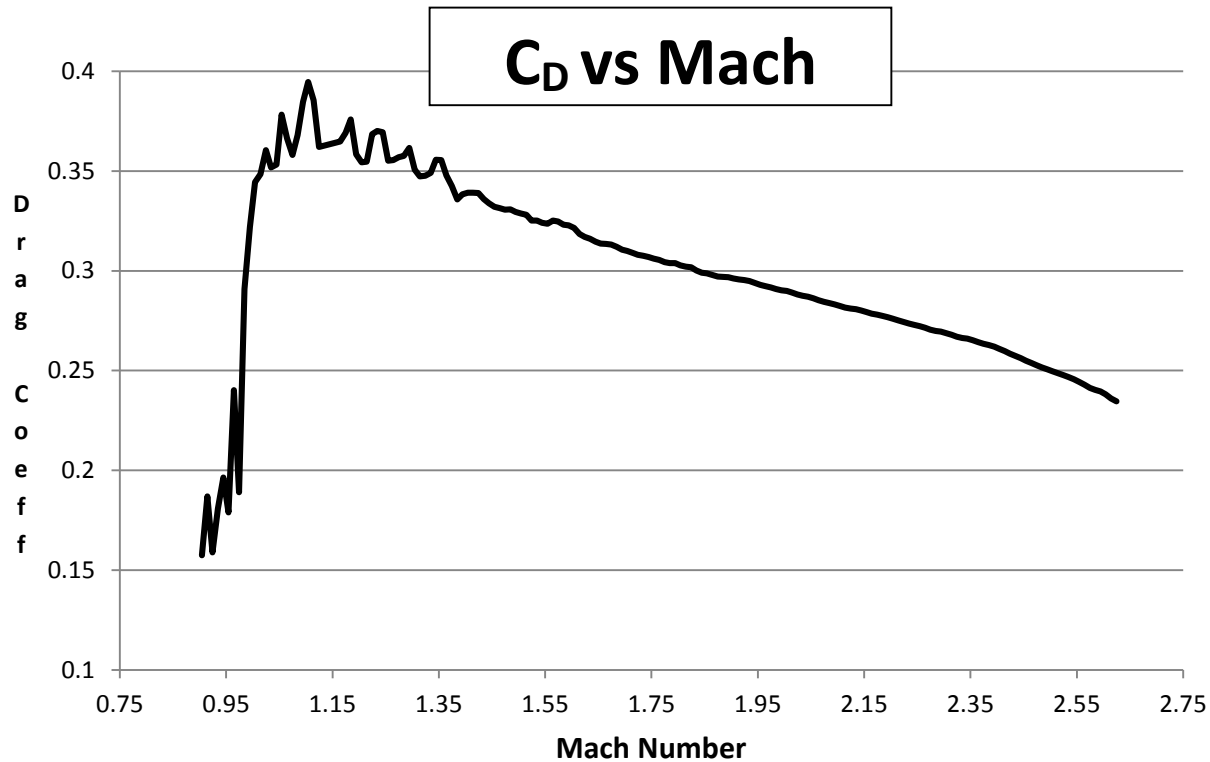


Figure 2. Unexpected Cd versus Mach Number Curve (convex initially – right side of graph)

At this point, a short discussion of how BC's have been determined is in order. For a very long time the BC has been measured by use of chronographs, which give a velocity at a discrete point in space. Typically a velocity measurement was made at a distance near the muzzle, then 100, 200 and perhaps as far as 300 yards from the first chronograph. The BC is then calculated by knowing the distance between the chronographs, and calculating the velocity loss between them. This loss is then converted to a BC as compared to some drag function standard, G1, G7, etc. This technique depends on very precise measurement of the distance between the chronographs and very accurate chronographs. Small errors in the distance between the chronographs, or small errors in the chronograph readings, can lead to significant errors in the BC. These techniques were fine for calculating BC's to approximate projectile trajectories/ballistics for short to moderate ranges. They gave an average result between two discrete points. However, it was impossible to know what happened between the chronographs. The data consisted of an average result over a long baseline.

Brian Litz performed ground breaking work several years ago to attempt to determine and catalog more accurate BC's for commonly used hunting and target projectiles. He used acoustic detectors to measure time of flight as a function of distance travelled to determine the BC. He used an array of detectors every 200 yards for 600 yards. He then assumed a classic shaped drag curve to fit to the small number of data points. This was a very ambitious project

and is still an impressive piece of work. This allowed a better picture of the average BC of projectiles and an approximation of the drag curve.

As good a piece of work as this is, it still lacked the resolution to see problems. Litz measured, in most cases, a small number of points and assumed a drag curve shape between and beyond his points. In most cases his test muzzle velocities were rather modest, Mach 2.2 – 2.4 (2,400 – 2,650 fps). He did not test at velocities high enough to see serious degradation to polymer tips and he did not have the resolution to see any abnormal effects that may have occurred.

It was obvious that something was changing in the tipped projectiles to cause a rapid increase in drag at higher velocities. The drag increases were most noticeable from 100 to about 500 yards. Drag increases stopped at velocities below approximately 2,100 fps. This behavior was not observed with hollow point or exposed lead (spitzer) style designs. The problem magnified as the velocity was increased. The problem was worse for heavier, higher BC projectiles that maintained higher velocities longer. After some consideration the answer was obvious and one that several people had wondered about for some time but had no way to prove their thoughts.

Figure 3. is a plot of aerodynamic stagnation temperature behind a shock wave versus velocity for ambient atmospheric conditions of 59 degrees Fahrenheit (F). Put simply it is the air temperature on a point behind a shock wave where the air flow is completely stopped. As the ambient air temperature goes up or down so goes the stagnation temperature. Think of the movies you have seen with the Space Shuttle or Apollo 13 with the vehicle reentering the atmosphere and the heat generated because of this. The only difference in small arms ballistics is we are talking hundreds of degrees instead of thousands of degrees. It's all a function of how fast an object is moving through the atmosphere. Now notice on the graph of Figure 3. that the Stagnation Temperature at 3,000 fps is approximately 850 degrees Fahrenheit (F). The tip of a bullet at 3,000 fps will see temperatures as high as 850 degrees F and decreasing as the bullet slows down. These temperatures on the tip were a known fact. What wasn't known was how long it would take at these peak and decreasing temperatures for the polymer tips to begin showing effects, if at all. As it turns out it is within the first 100 yards of flight. Currently used polymers in projectile tips begin to have properties like rubber at approximately -65 to 50 degrees F and will melt at 300 to 350 degrees F, depending on the exact polymer.

All current polymer tipped projectiles have tips that are at best softening and deforming in flight and under many circumstances melting and badly deforming. To cut through a lot of technical discussion the problem becomes worse at higher ambient air temperatures (summer) and higher launch velocities. Projectiles that have a high BC and retain velocity well see higher stagnation temperatures for longer lengths of time and have greater degradation of the tip. Simply put it is a heat capacity problem, temperature times time. This makes BC's for current tipped projectiles a rough average over some distance, dependent on atmospheric conditions and muzzle velocity, and does not allow the accurate prediction of downrange ballistics much beyond 400 yards.

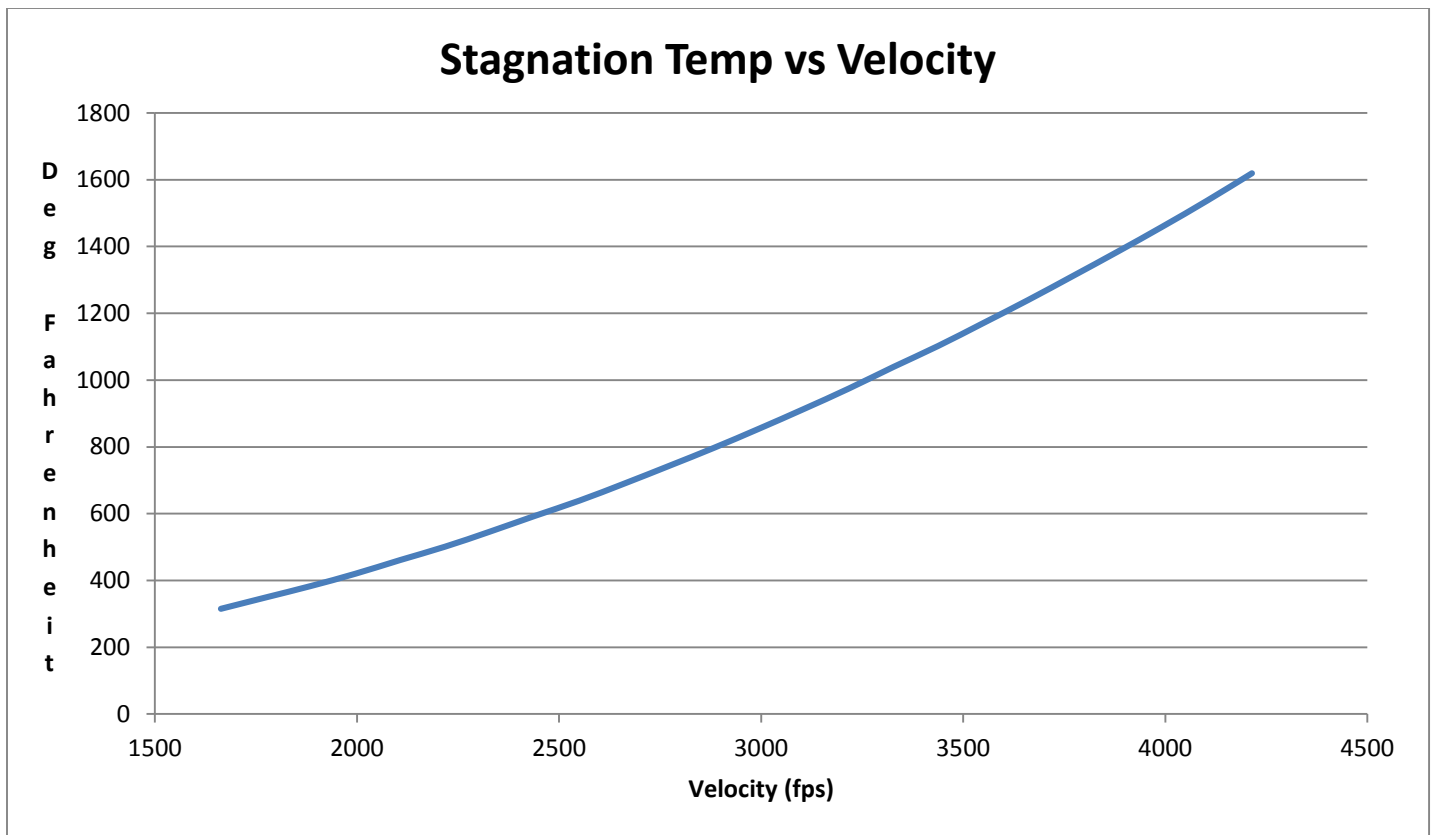


Figure 3.

As a result of these findings Hornady conducted months of testing and research with different polymer tip designs and different polymer materials. The result of this research is the development of the Heat Shield Tip™ which employs a patent pending polymer tip. The material in the Heat Shield Tip™ does not begin to exhibit rubber like properties until above 420 degrees F. It does not have a discreet melting point, but instead maintains rubber like properties to very high temperatures. The polymer has to be heated to temperatures of over 700 degrees F just to be pliable enough for high pressure injection molding. The new Heat Shield Tip™ will be offered in the ELD™ Match line of bullets and the new ELD-X™ line of hunting bullets. These tips are easily distinguished from current tips by their deep red, translucent ruby like appearance. Figure 4. shows a picture of the Heat Shield™ tip.

The development of these tips has resulted in Hornady being able to introduce a new line of ELD™ Match bullets, as well as produce the ELD-X™; the most advanced hunting bullet available today. There are no compromises with the ELD-X™ line of hunting bullets. Because of the stable tip shape and consistent drag from bullet to bullet we have seen increases of approximately .25 - .3 moa in accuracy of ELD™ Match bullets over existing conventional tipped bullets at longer ranges as well as match accuracy from the ELD-X™ projectiles.



Figure 4. Heat Shield Tip



Figure 5.

Three 30 cal 200 grain ELD-X™ projectiles fired from a Gunwerks LR1000 300 Win Mag from a bench at 930 yards in calm conditions. The red circle is the size of the cap on a spray paint can. The group is approximately 4" = .390 MOA

So as not to cause everyone to go throw out all their tipped projectiles, this problem has very little impact on shooting inside of 400 yards with typical hunting or varmint projectiles. The change in BC is still occurring over these distances but flight time has not been sufficient to cause changes in trajectory that most shooters are capable of detecting. In addition, most commonplace hunting and varmint projectiles have modest BC's and do not exhibit the extent of drag increase and BC loss because they lose velocity much more rapidly than the very low drag (VLD) type projectiles we are concentrating on in this discussion. They are not exposed to the high stagnation temperatures as long and don't see as much degradation of the tip. However, with VLD projectiles this is not the case. They retain higher velocities longer and expose the tip to higher levels of heat input. The larger changes in drag/BC which the VLD projectiles see has noticeable effects on long range shooting in elevation, wind drift and accuracy as compared to a projectile that maintains a stable nose shape and drag. These changes in the drag on the projectile will reduce impact velocities at 800 yards 75 to 125 fps. This loss of velocity/energy is directly correlated to a loss in terminal performance.

Figure 6. shows a graph of the high speed Cd vs Mach Number for the Nosler 7mm 175 Accubond LR and the New Hornady 7mm 175 ELD-X™ with Heat Shield™ tip fired from the same rifle, at the same velocity, within seconds of each other in the same conditions at 36 degrees F air temperature. As can be clearly seen, both projectiles start at virtually the same drag but rapidly diverge with the Nosler bullet developing substantially higher drag.

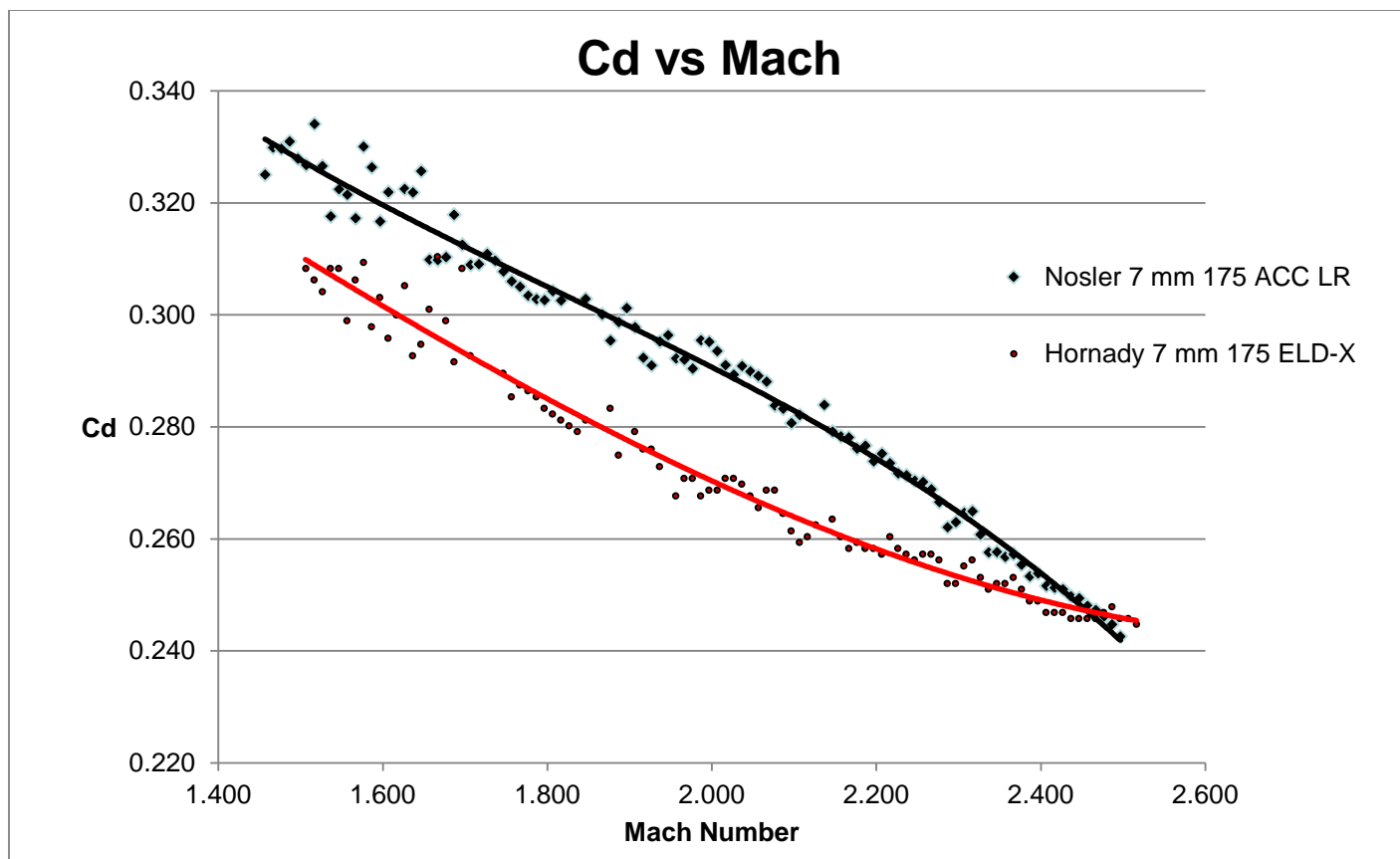


Figure 6.

Figure 7. shows a Nosler 7mm 175 Accubond LR high speed Cd versus Mach Number graph for ambient temperatures of 36 and 79 degrees F. The graph clearly shows the convex shape of the drag curve for both conditions. The current tip materials exhibit the aerodynamic heating problem even at low ambient temperatures and get worse at higher ambient temperatures.

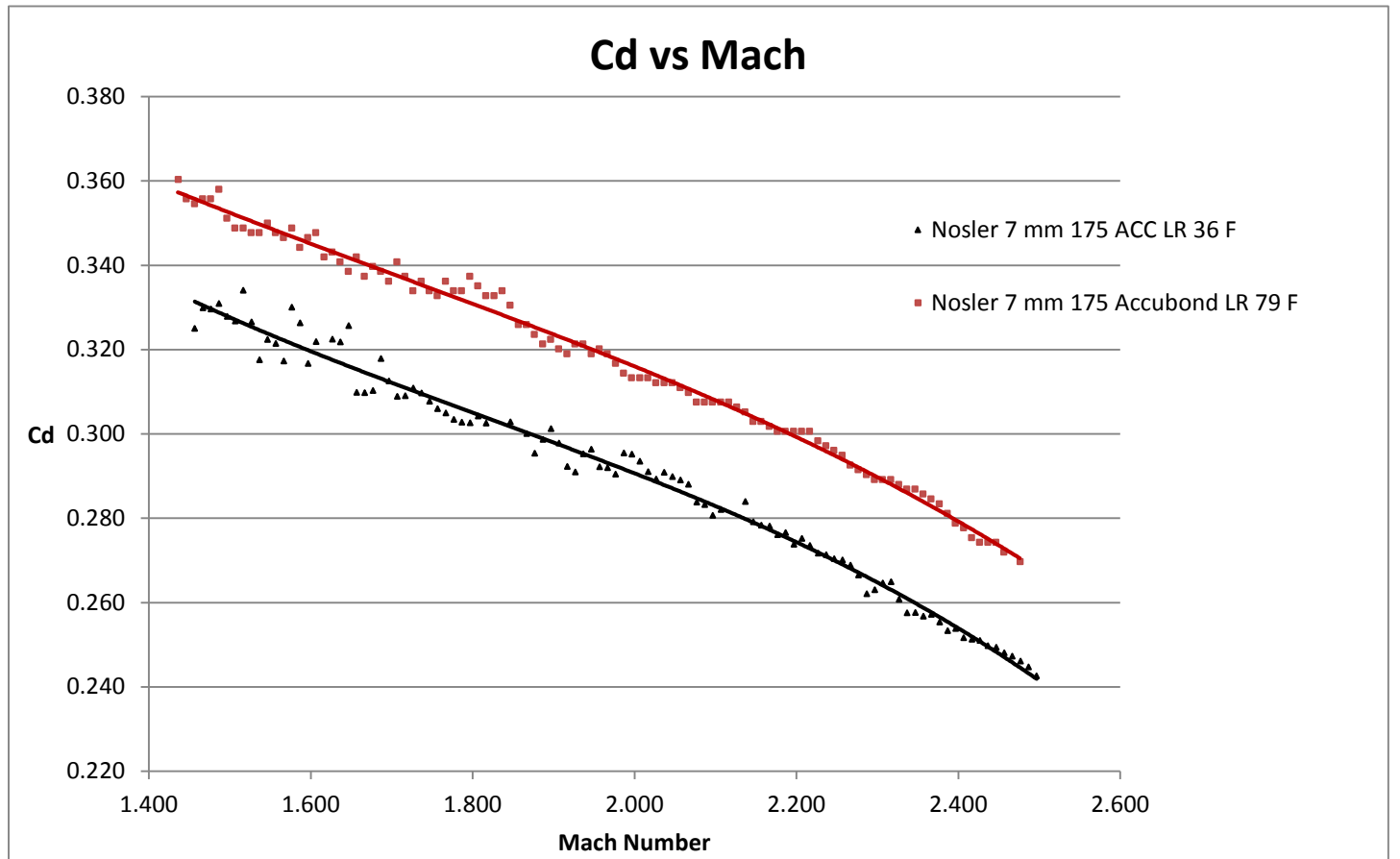


Figure 7.

Figure 8. shows the Cd versus Mach Number graph for the Hornady .30 200 ELD-X with Heat Shield Tip at 36 and 71 degrees F. The graph clearly shows the correct concave shape of the drag curve as well as very little difference in the drag on the projectile between the two conditions. The differences seen are essentially within the shot to shot variation in the drag. The Heat Shield™ tip clearly shows an advantage in drag and therefore downrange ballistics over currently used tip materials.

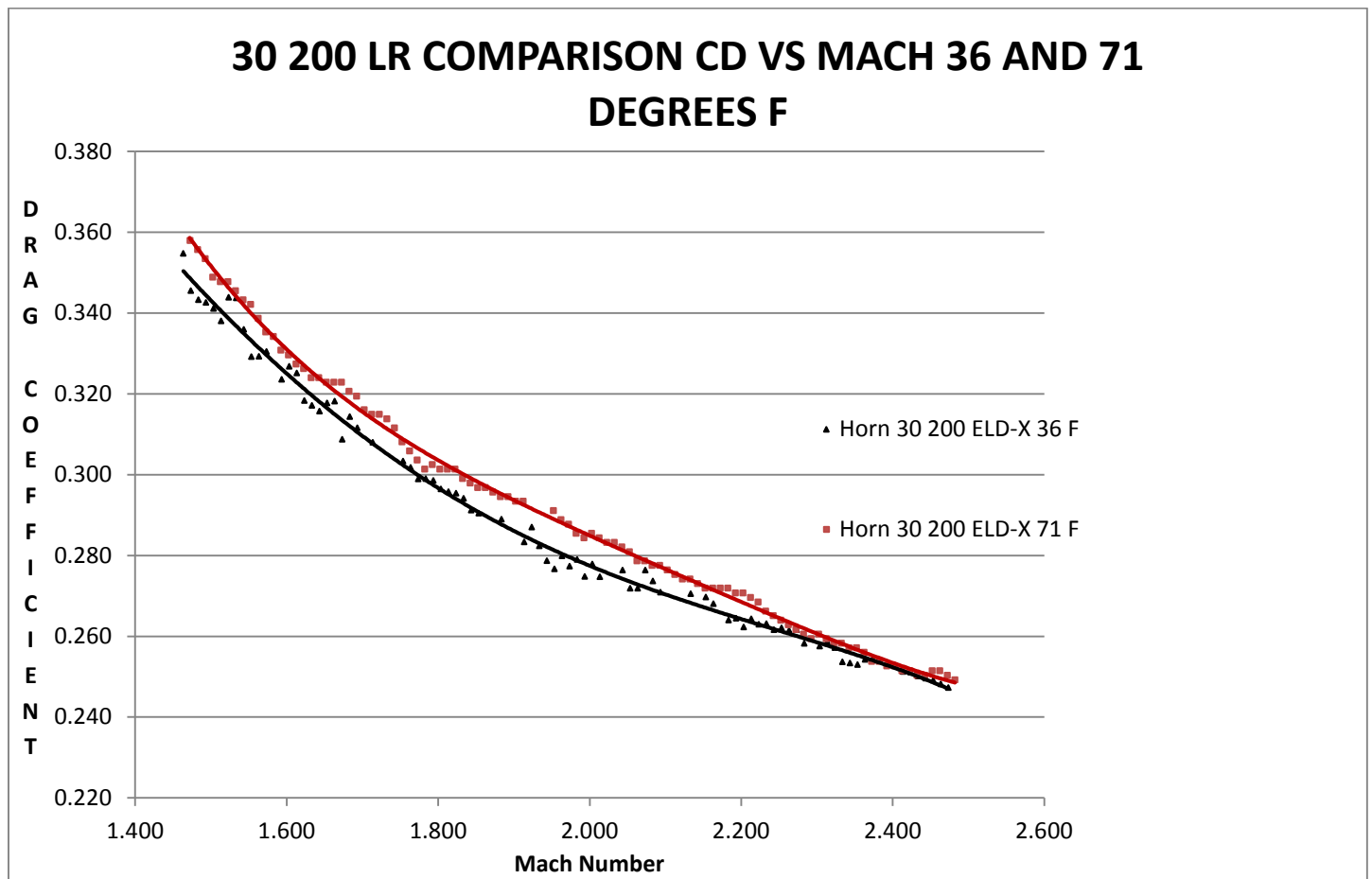


Figure 8.

Table 1. shows the Doppler radar measured BC's of a sampling of currently available hunting bullets marketed as long range projectiles along with the new Hornady ELD-X™ projectiles with Heat Shield™ tip. These BC's are measured over a distance of 800 yards and are averages of testing at temperatures of approximately 30 degrees F and 80 degrees F then corrected back to Standard Atmosphere*. All bullets were shot from the same rifles at SAAMI standard velocities for common magnum cartridges.

* All Hornady BCs are always corrected back to Standard Atmosphere: Sea Level, 59 degrees Fahrenheit, 29.59 in Hg, .07647 lb./cu ft. (density).

Table 1.

| <u>Projectile</u> | <u>G1 B.C.</u> | <u>G7 B.C</u> |
|---------------------------|-----------------------|----------------------|
| <u>7mm</u> | | |
| <u>Barnes</u> | | |
| 145 LRX | .450 | .226 |
| <u>Berger</u> | | |
| 168 VLD H | .626 | .313 |
| 180 VLD H | .677 | .340 |
| <u>Hornady</u> | | |
| 162 ELD-X™ | .613 | .308 |
| 175 ELD-X™ | .660 | .330 |
| <u>Nosler</u> | | |
| 150 AccuBond LR | .544 | .274 |
| 168 AccuBond LR | .599 | .301 |
| 175 AccuBond LR | .625 | .313 |
| <u>.30 Caliber</u> | | |
| <u>Barnes</u> | | |
| 175 LRX | .450 | .226 |
| 200 LRX | .480 | .242 |
| <u>Berger</u> | | |
| 185 VLD H | .573 | .287 |
| 190 VLD H | .578 | .290 |
| 210 VLD H | .631 | .318 |

Hornady

| | | |
|------------|------|------|
| 200 ELD-X™ | .626 | .315 |
| 212 ELD-X™ | .670 | .335 |

Nosler

| | | |
|-----------------|------|------|
| 190 AccuBond LR | .555 | .279 |
| 210 AccuBond LR | .630 | .315 |

ELD-X™ (Extremely Low Drag – eXpanding) Bullets

DISCLAIMER: The following narrative and illustrations show the performance differences of several popular hunting bullets. It also depicts the improved performance of the new Hornady ELD-X™ hunting projectile with the innovative Heat Shield Tip™. The intent is not to disparage any manufacturer's products, but simply display data.

INTRODUCTION

Hunters need ammunition topped with flexible and highly reliable bullets to ensure optimal external and terminal ballistic performance. In other words, they should be accurate, heavy-for-caliber and maximize the ballistic coefficient (BC) to extend the 'point blank' range. They should not fragment at short range, i.e., at high velocity impact, but also deliver reliable and predictable expansion at extended ranges with significantly lower retained velocities.

Hunting bullet designs and performance have improved dramatically in recent years. In addition to the conventional cup and core bullet with an exposed lead tip, we now have solid/monolithic bullets, hollow points, cup and core tipped and bonded tipped designs.

Solid and bonded tipped bullets sometimes fail to deliver the desired accuracy and aerodynamic performance. They also may not provide the desired terminal performance at one or *both* ends of the velocity spectrum, i.e., they explode and/or fail to expand on impact. Hollow point bullets have recently gained acceptance by some hunters. Of course, they provide excellent aerodynamic performance but, again, terminal performance is unpredictable and can often be unreliable.

Terminal performance test results presented herein are based on actual impact velocities acquired from repetitive and carefully recorded Doppler radar data. All testing was done at 2,380 feet ASL and test velocities are measured by Doppler radar from standard velocity loads. All testing was performed in a controlled environment.

Simply reducing the muzzle velocity of a projectile in a 'standard' twist rate barrel is not adequate for low speed impact testing. The resulting bullet spin rate and stability would be much lower than actually occurs and would not provide accurate projectile dynamics or terminal performance. Hornady used test barrels with fast twist rates, matched to actual impact velocities and spin rates calculated by the PRODAS computer code that provided the correct bullet impact and rotational velocities corresponding to the extended range impact velocities. All test barrel terminal performance results were confirmed with conventional tests at exact distances with standard barrels.

Until recently, no one had investigated the potential for aerodynamic heating degradation of the ubiquitous polymer tip and its suspected potentially adverse effect on ballistic performance. Specifically, I will describe a significant

improvement in the materials used to make small arms projectile polymer tips and how this substantially enhances the projectile's overall performance.

The new Hornady ELD-X™ hunting bullets are designed to deliver the highest BC possible for the specific bullet caliber and weight. They also provide match level accuracy at long range and effective terminal performance from maximum safe initial velocities down to ~1600 fps. In addition, the Heat Shield™ tip creates the perfect meplat that is replicated every single time, and is not affected by aerodynamic heating.

Hollow Point Designs

For several years there has been a considerable amount of promotion of Hollow Point (HP) match projectile designs for hunting. These designs have been promoted as meeting the accuracy and aerodynamic performance necessary for all types of hunting, including long range. While it is certainly true that these types of projectiles attain high levels of accuracy and have high BC's they are unreliable and unpredictable in their terminal performance. Several of the design features of the HP match type projectile severely hinder its application as a hunting projectile. Typical HP match projectiles have very thin jacket designs in order to achieve high jacket concentricity and associated accuracy. The thin jacket design causes the bullets to fragment at high retained velocities, producing inadequate penetration and terminal performance. Hollow point projectiles are designed with a very small nose or meplat on the projectile. The hollow point is closed up to a very small size in order to maximize the BC. This small meplat diameter prevents expansion at lower retained velocities and causes the projectile to penetrate a substantial distance, 6" – 9", before the bullet yaws and goes end over end. It never actually expands. This results in unpredictable effects on the animal with small early wound channels and an unpredictable bullet path.

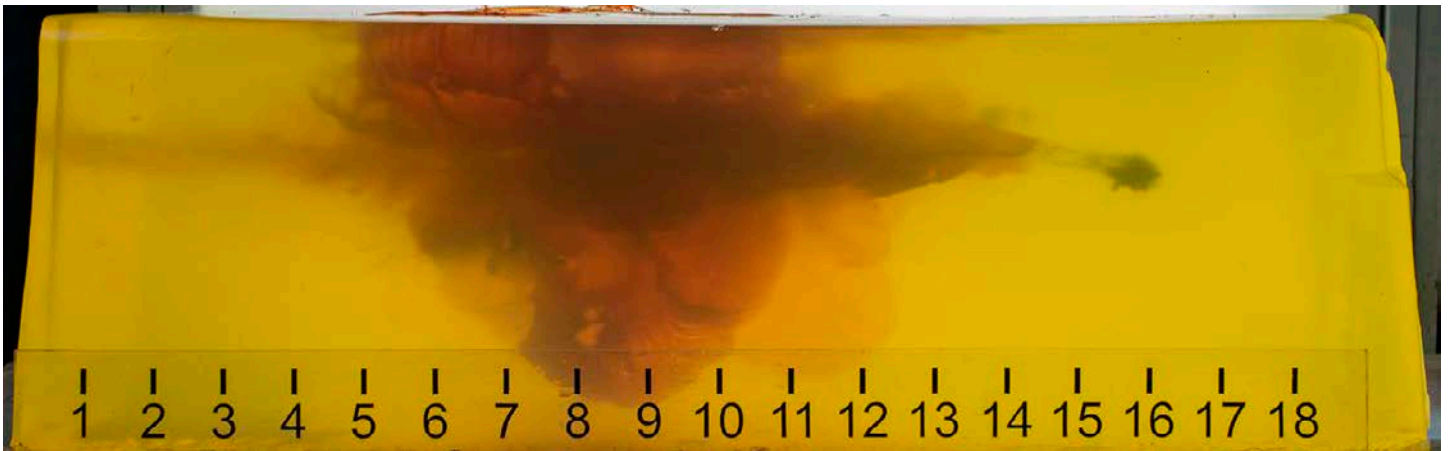


Figure 9.

Berger .30 cal 190 gr VLDH, 150 yard impact from 300 Win Mag @ 2,664 fps in Gelatin

Penetration: 16"

Bullet traveled 5" with no reaction. Wound cavity 9" deep. Jacket core separation, bullet fragmented with low retained weight.



Figure 10.

Berger .30 cal 190 gr VLDH after high speed gelatin impact

Retained weight: 75.0 gr (39.5%)

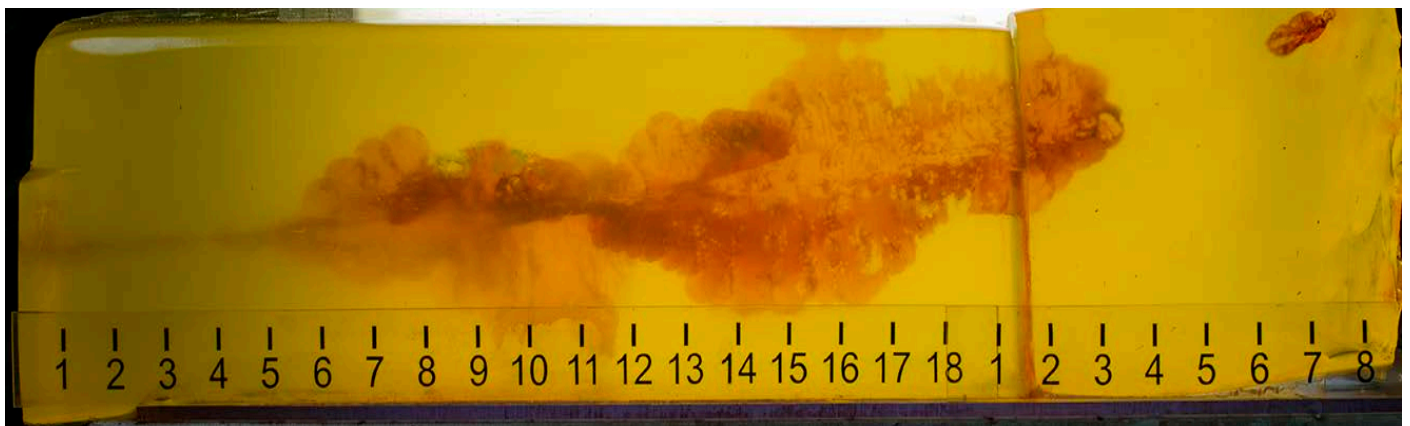


Figure 11.

Berger .30 cal 190 gr VLDH, 800 yard impact from 300 Win Mag @ 1,726 fps in Gelatin

Penetration: Exited gelatin at 25"

Projectile penetrated 6.0" before yawing and tumbling. Projectile did not expand. Projectile did not follow a straight path.



Figure 12.

Berger .30 cal 190 gr VLDH after low speed gelatin impact

Retained weight: 178.9 grains (94.2%)

As can be seen in the above photographs, the terminal performance of HP projectiles for hunting is unpredictable.

Bonded Tipped Projectile Designs

Recently a line of bonded tipped projectiles has been offered which are marketed as very high BC, high accuracy and excellent terminal performance. These projectiles have very good designs for aerodynamics on paper, and very high claimed BC. However, as will be shown in detail further in this paper, these projectiles fall far short of claims for BC. These projectiles have also failed to deliver accuracy levels required for longer distance shooting. Bonded projectiles typically do not produce the accuracy that non-bonded, drawn jacket, swaged lead core projectiles do. There is not as much flexibility in the manufacturing process with a bonded projectile as a non-bonded projectile. The tipped, bonded projectiles that have been tested have had very unpredictable long range low velocity terminal performance. The low retained weight and shallow wound cavities at short ranges limit their versatility. Bonded bullets usually have to use softer lead for bonding and because of this do not have as much flexibility to control expansion and penetration at higher velocities.



Figure 13.

Nosler .30 cal 190 gr Accubond LR, 150 yard impact from 300 Win Mag @ 2,661 fps in Gelatin.

Penetration: 18"

3.0" of penetration before any reaction. Temporary cavity 9.5" deep.



Figure 14.

Nosler .30 cal 190 gr Accubond LR after high speed gelatin impact

Retained weight: 79.5 grains (41.8%)

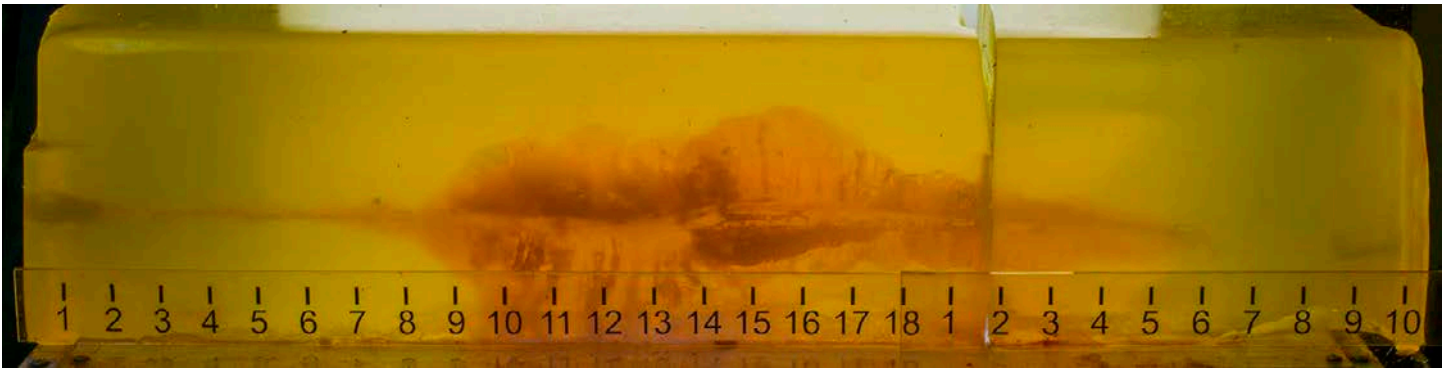


Figure 15.

Nosler .30 cal 190 gr Accubond LR, 800 yard impact from 300 Win Mag @ 1,752 fps in Gelatin

Penetration: 27.0" (exited bottom of gelatin block)

Projectile penetrated 9" before beginning to tumble. Projectile did not expand.



Figure 16.

Nosler .30 cal 190 gr Accubond LR after low speed gelatin impact

Retained weight: 186.8 gr (98.3%)

Monolithic Tipped Projectile Designs

Monolithic projectile designs have been available for quite some time. They offer very good terminal performance at typical hunting ranges, with virtually 100% retained weight and deep penetration. They have not been known for the levels of accuracy needed for extended range shooting, but have more than adequate accuracy for typical hunting distances. Recently a line of “Long Range” tipped, monolithic, projectiles has been offered. These projectiles have been designed with longer ogive and boat tail lengths in order to try to achieve higher BC’s. These projectiles are heavier and much longer than typical monolithic hunting bullets. They have two or three grooves on the bearing surface to lower the rifling engraving forces, improve interior ballistics and accuracy, and reduce copper fouling.

Several limitations exist with monolithic projectile designs for a versatile, all around hunting projectile. As mentioned above, the monolithic projectiles have adequate accuracy for normal hunting ranges, but do not have accuracy levels necessary for extended distance shooting. As will be shown in detail below, the monolithic designs have low BC’s for their weight. This is because of stability considerations and the grooves on the projectile. The grooves substantially increase the skin friction drag on the projectile as well as cause boundary layer separation, both of which result in a low BC. The current “Long Range” designs above are very long. They are advertised, for the most part, as appropriate for standard twist rates. However, at colder atmospheric temperatures the stability margins are very low and are marginal at moderate temperatures. This can result in substantial projectile first yaw, and a yaw cycle which continues for a long distance downrange; both of which hurt the accuracy and BC. The monolithic projectiles are limited on their longer distance terminal performance because of low retained velocity, as a result of the low BC, and their inherent design. At lower velocities it is much more difficult to get the monolithic projectiles to expand because of the harder, tougher material they are made from.

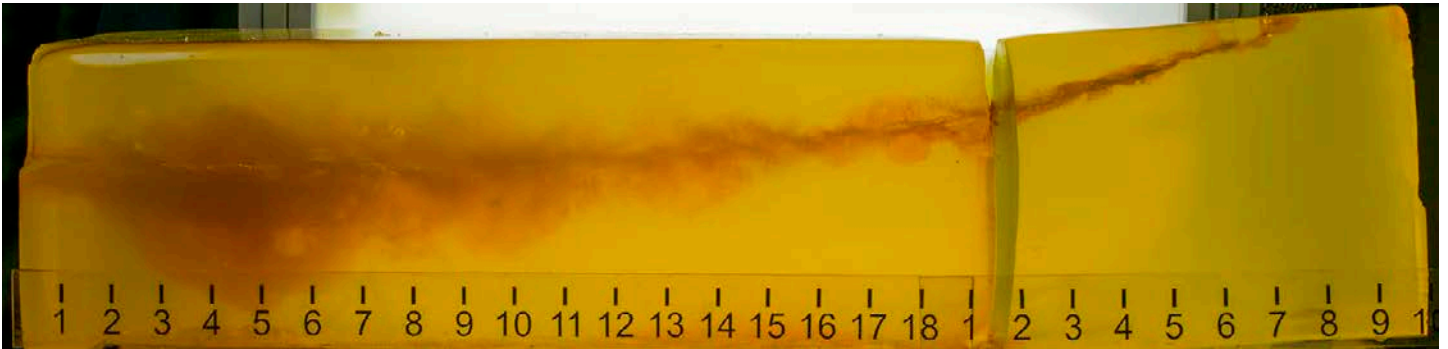


Figure 17.

Barnes .30 cal 200 gr LRX, 150 yard impact from 300 Win Mag @ 2,553 fps in Gelatin

Penetration: 26.5” (exited top of gelatin block)



Figure 18.

Barnes .30 cal 200 gr LRX after high speed gelatin impact

Retained weight: 198.9 grains (99.5%)

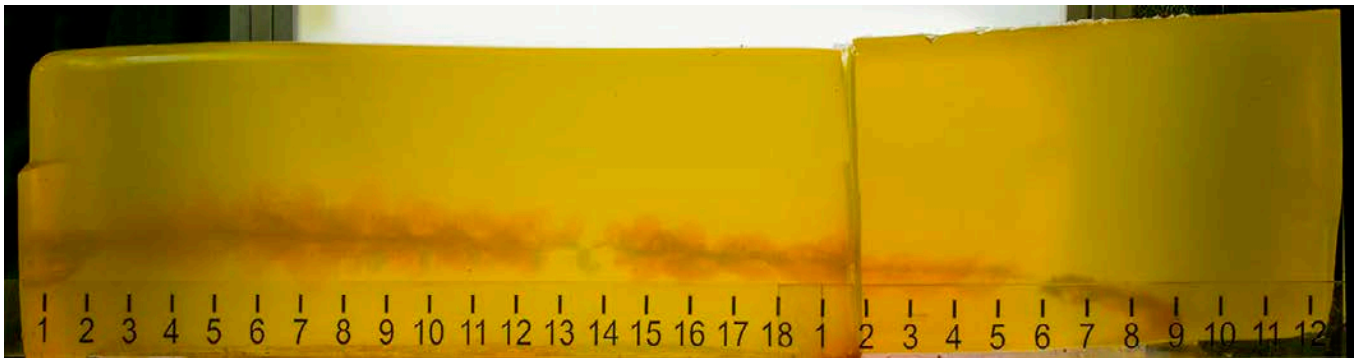


Figure 19.

Barnes .30 cal 200 gr LRX, 800 yard impact from 300 Win Mag @ 1,524 fps in Gelatin

Penetration: 27" (Projectile exited the bottom of the gelatin block, virtually no expansion)



Figure 20.

Barnes 30 cal 200 gr LRX after low speed gelatin impact

Retained weight: 199.5 gr (99.8%)

Hornady ELD-X™ Hunting Bullet Design

The ELD-X™ projectiles are designed to provide the most versatile terminal performance over the widest range of velocities possible. They are designed with ground breaking aerodynamic performance and outstanding accuracy. The jacket and core construction in the nose is designed to ensure expansion at low velocities. The tip cavity in the core and jacket mouth have been designed to allow the tip to setback and force the jacket open, even at very low retained velocities. The shank of the projectile has been designed with an extremely thick jacket and a high Interlock®. The result is that the high Interlock® acts to retain the core at all velocities and also acts as an expansion stop. At short range and high retained velocity, the bullet continually expands through most of its penetration, protecting the integrity of the bullet shank. This ensures that the shank of the projectile provides deep penetration. The design provides normal bullet expansion beyond 500 yards and dramatic expansion with the necessary retained weight for deep penetration at ranges under 500 yards. It makes very large and deep wound cavities through the target at short range. At longer ranges it performs like a traditional mushrooming projectile.

This type of jacket design and performance was pioneered in the Hornady Flexlock® line of projectiles. Both lab and field testing have shown that these projectiles at short range retain approximately 50% of their original weight yet expand to 1.5 X their diameter down to velocities of 1,750 fps. They will provide effective expansion down to 1,600 fps. At low retained velocities the projectiles retain approximately 85% of their original weight. Penetration at both high and low velocities typically measures 19" – 23" in gelatin depending on the bullet weight, impact velocity and material encountered in the target. These bullets are designed to provide lethal terminal performance at any practical hunting range.

The aerodynamic design of the ELD-X™ projectiles sets a new standard for BC and accuracy. The Patent Pending Heat Shield Tip™ was designed after extensive testing with Doppler radar, which provides velocity, distance and drag data to ranges of a mile or more depending on the projectile caliber. As was previously detailed, Doppler radar testing showed that abnormal increases in drag and loss in ballistic coefficient were observed in all brands of tipped projectiles during the first 400 to 600 yards of flight. The new Heat Shield™ tip has eliminated this problem, resulting in the most accurate, versatile and highest BC hunting projectiles currently available.



Figure 21.

.30 cal 200 gr ELD-X™ from a 300 Win Mag, recovered from an Elk shot at 110 yards. The projectile broke both front shoulders and was found under the hide on the off side. Retained weight: 92 grains (46 %).



Figure 22.

.30 cal 200 gr ELD-X™ recovered from an Elk shot at 450 yards, from a 300 Win Mag. The projectile penetrated through ribs and the lungs just behind the shoulder. The bullet was found under the hide on the offside. Retained weight: 117.5 grains (59 %).

Elk have been taken at ranges to 730 yards and Antelope at 850 yards with large wound cavities but no recovered bullets because of complete penetration. Eland (1,800 lbs.) and Wildebeest have been taken at ranges of 650 to 850 yards with a single shot that resulted in large wound cavities and massive internal bleeding.



Figure 23.

Hornady .30 cal 200 gr ELD-X™, 150 yard impact from 300 Win Mag @ 2,640 fps in Gelatin

Projectile expansion immediate, temporary cavity 18" deep.

Penetration: 24"



Figure 24.

Hornady .30 cal 200 gr ELD-X™ after high speed gelatin impact

Retained weight: 132 gr (66.0%)

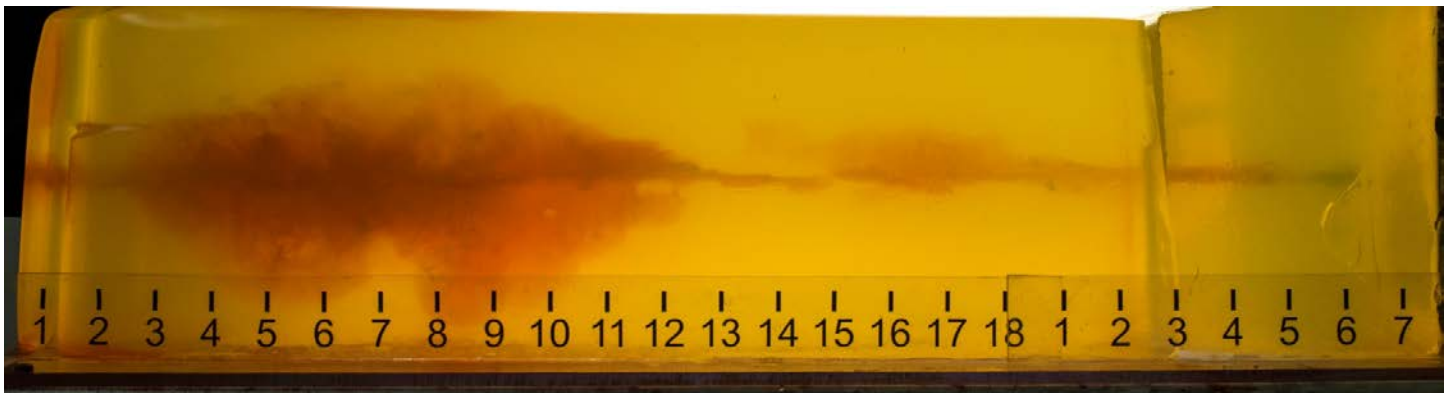


Figure 25.

Hornady .30 cal 200 gr ELD-X™, 800 yard impact from 300 Win Mag @ 1,840 fps in Gelatin

Projectile expanded within 1.5", temporary cavity 16.5" deep. Straight penetration.

Penetration: 24.5"



Figure 26.

Hornady .30 cal 200 gr ELD-X™ after low speed gelatin impact

Retained weight: 169.2 grains (84.6%)

Summary

As discussed above, during the development of the new ELD-X™ line of hunting projectiles, some surprising performance results were obtained with currently produced polymer tipped projectiles. Extensive, in-house Doppler radar testing confirmed the suspected adverse aerodynamic heating impact on currently used polymer tip materials. In-flight degradation of the tip resulted in reduced extended range ballistic performance especially of heavy-for-caliber, high BC projectiles. Hornady successfully developed the new ELD-X™ line of hunting projectiles in response to this discovery. The combination of the significantly improved (patent pending) Heat Shield Tip™ with the new ELD-X™ projectile design resulted in today's most flexible, high performance hunting bullet. They reliably provide excellent terminal performance from short to extended range velocities. Additionally, the Heat Shield™ tip revelation led to an entirely new and previously unplanned match bullet line introduction. Hornady has now created the ELD™ Match bullet line that feature perfect meplats that guarantee bullet-to-bullet, and lot-to-lot consistency as well as highest in class BCs and accuracy.