



## A New Cartridge for the AR:

by David M. Fortier  
Photography by Emily K. Fortier

# The 6.5mm Grendel from Alexander Arms

*At the 2004 SHOT Show, Alexander Arms, LLC officially unveiled an interesting new intermediate cartridge specifically intended for use in the AR-15. Dubbed the 6.5mm Grendel, it is intended to improve the ballistics and terminal performance of this popular rifle.*

While the .223 Remington has proven to be capable of excellent accuracy, many have long wished for a cartridge throwing a larger diameter and heavier bullet. NRA High Power competitors, impressed by the accuracy and ergonomics of the basic AR design wished for a cartridge with less wind drift for 600 yard competition. The 6.5mm Grendel was designed to meet both of these needs. While similar in size to a common 7.62x39mm round, the use of highly efficient projectiles with very high Ballistic Coefficients provide the Grendel with surprising long range performance.

The concept of re-chambering the AR for a larger caliber is hardly new. The 6x45mm Wildcat was an early attempt to add performance to the AR in the days before heavy .224 diameter projectiles were available. J.D. Jones has also done extensive work in this area. The biggest push probably came from competitive shooters looking for added performance to improve their scores. NRA High Power shooters looking to decrease the amount of wind deflection they had to fight with on the 600 yard line led to AR Match rifles being built

in a variety of calibers. These included .22 PPC, 6mm PPC, and Derick Martin actually built one in the fat 6mm Benchrest. Something a little more interesting was a 6.5mm wildcat built by Mike Bykowski on a .30 Remington case. This would be considered a forerunner to Remington's new 6.8x43 SPC. Unfortunately, rifles in all these calibers were only built in very limited numbers by individual gunsmiths. None went into full production. Additionally, while cartridges like the .22 PPC and 6mm PPC offered certain advantages in competition, they offered little over the .223 Remington for practical field use.

The main stumbling block when working with the AR-15 design is the confines of its magazine well. This

dictates the maximum overall length of the cartridge as well as its maximum diameter. As Alexander Arms first began working on the concept, they ran into the problem of what to use for a base cartridge. As they examined their options, one case that seemed to hold the most promise was the



**Lead photo, above:** A current production 24-inch 6.5mm Grendel rifle from Alexander Arms with 17-round magazine.

**Right:** The 6.5mm Grendel (center), here compared to a .308 (left) and .223 (right), adds performance to the AR-15 family without the bulk and weight of an AR-10.

6mm PPC. This incredibly successful Benchrest cartridge was designed by Dr. Lou Palmisano and Ferris Pindell in 1975 and is the benchmark by which all other cartridges are measured in terms of accuracy and it just happened to mate well with the parts they had on hand. Plus, they felt that this was the largest diameter case that would double stack and feed reliably through a magazine within their size limitations. Cases of larger diameter begin to bind, causing reliability problems.

While the 6mm PPC case seemed like a logical choice dimensionally, they felt the terminal performance would be enhanced by increasing the base area of the projectile. They considered .25 caliber but quickly moved on to 6.5mm (.264) and 7mm (.284). Both of these calibers offer a diverse range of very aerodynamically capable projectiles in various weights with extremely high Ballistic Coefficients (BC's). This feature was important to them as their concept was not to go crazy chasing velocity, but rather to use extremely efficient projectiles. Such projectiles would lose less precious velocity due to their BC's being so high. While they considered the 6mm PPC necked up to take 7mm projectiles, they ate too deeply into case capacity. Another problem encountered was that the bullet weights were simply disproportionate to available case capacity. In the end the physical dimensions of the rifle constrained them to utilize a 6mm PPC case slightly modified and necked up to 6.5mm.

To test the concept, a rifle was built using a 24-inch stainless steel 6.5mm Lothar Walther Match barrel. This featured 6 groove rifling with a 1:9 inch RH twist and



**Above:** To increase downrange performance, the 6.5mm Grendel was designed to use projectiles with high BCs. (L to R) Lapua 144 and 123, Hornady 129 SST, Nosler 120 Ballistic Tip, Speer 90-grain TNT.

an 11 degree Match crown. The barrel was free-floated via a synthetic handguard pirated from an AR-10. The rifle's feed ramp was modified, the height of the ejection port was raised slightly, and a 7.62x39mm bolt head was substituted. Then some USA brand 7.62x39mm magazines were modified and the rifle was put to work. Not only did it work, but it worked quite well. I had a chance to compete with this prototype using preproduction ammunition in a 200/

300 yard any rifle/any sight prone Match late in 2003. Shooting unsupported prone with a sling, the rifle posted a 599-33X out of a possible 600-60X. This score was shot using a load driving a 120-grain Nosler Ballistic Tip at 2,564 fps.

Impressed by the potential of the concept, Alexander Arms continued to refine the cartridge. Then, Lapua of Finland was brought on board to finalize case design and to produce cartridge cases. This was a relatively simple process considering Lapua's familiarity with the .220 Russian, .22 PPC and 6mm PPC cases. The parent case of all of these is the Russian 5.6x39mm, which was used with great success by Russian teams in International Running Deer competitions. Finnish shooters also experimented with this cartridge and Lapua and Sako both produced brass case ammunition. The .220 Russian was developed from this, which led to the PPC and now the Grendel. I spoke to Janne Pohjoispaa, an R&D engi-



**Left:** In the last few years a number of new cartridges have been introduced to enhance the versatility of the AR. (L to R) 5.56, 6.5mm Grendel, 6.8x43 SPC, .458 SOCOM, .50 Beowulf.

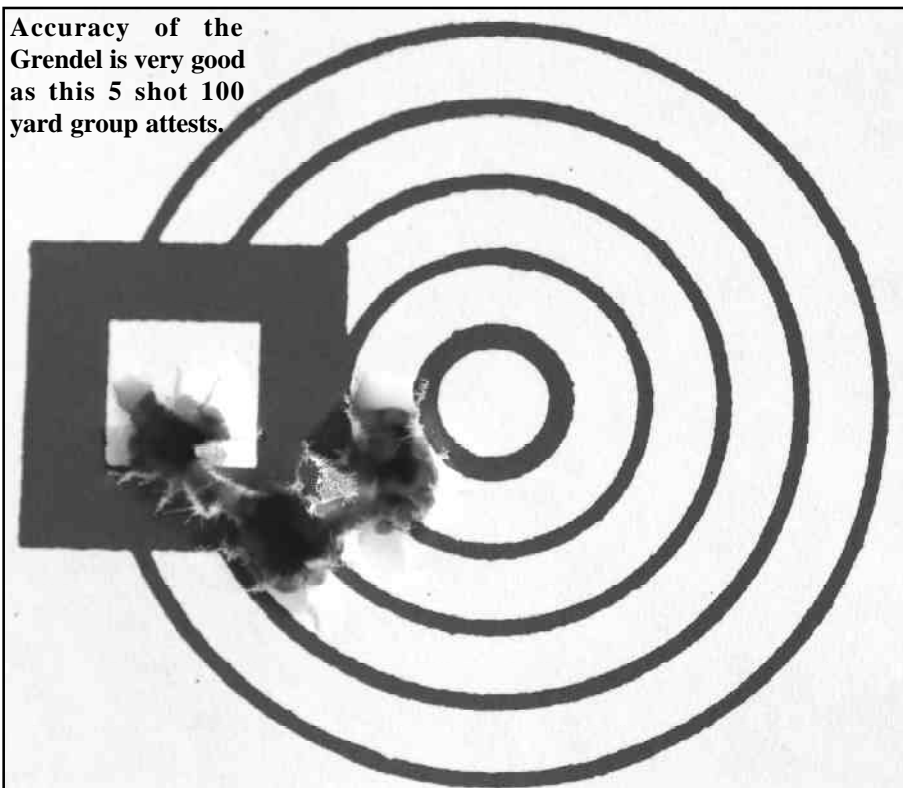
neer for Nammo Lapua, and he stated bluntly, "there is no long way from .220 Russian to 6.5mm Grendel." Basically, the prototype 6.5mm PPC based case had the shoulder moved forward slightly to increase case capacity and the neck was thickened to improve case life for reloaders.

The finalized cartridge has a .441 inch diameter casehead (like a 7.62x39mm) and an overall length of 1.524 inches (38.7mm). As it is intended for use in a self-loading rifle it features a .059 inch thick rim. This is significantly thicker than the .043 inch rim utilized on 5.56mm ammunition. Shoulder angle is 30 degrees and a small rifle primer is utilized in conjunction with a small .061-inch flash hole. Overall length for rounds fitting into an AR magazine runs from 2.20-2.270 inches depending upon projectile.

The result is a handsome little cartridge which fits neatly into the confines dictated by the AR-15's magazine well. However, due to its diminutive size one would expect this round to be a purely short range number, perhaps useful to 300-400 yards. Such is not the case. While initial velocity is not particularly high (2,650 fps with the factory 123-grain Lapua load) the case was specifically designed to allow use of projectiles with extremely high Ballistic Coefficients. This makes the cartridge extremely efficient, and performance at extended distances is substantially better than one would expect.

It is the potential of this cartridge that is most interesting. Production ammunition loaded with a 6.5mm Lapua Scenar clocked 2,680 fps from my review rifle. This, mated to the Lapua's BC of .542, gives impressive performance in such a compact package. As an example, at 500 yards, the Lapua still has over 1,000 ft-lbs of energy and it has more energy at 1,000 yards than a 77-grain Sierra MatchKing driven at 2,750 fps from a 5.56 has at 500 yards. Better still, it has a flatter trajectory and less wind drift than a .308 175-grain MatchKing driven at 2,650 fps, all the way out to 1,000 yards. Neither is accuracy lacking. A production Grendel rifle was shot in front of USMC personnel at Quantico. From a machine rest, it placed 10 rounds of this load into a group 2 inches high by 3 inches wide at 350 yards and 10 inches high by 12 inches wide at 1,000 yards.

**Accuracy of the Grendel is very good as this 5 shot 100 yard group attests.**



Currently Alexander Arms offers four loads in this caliber:

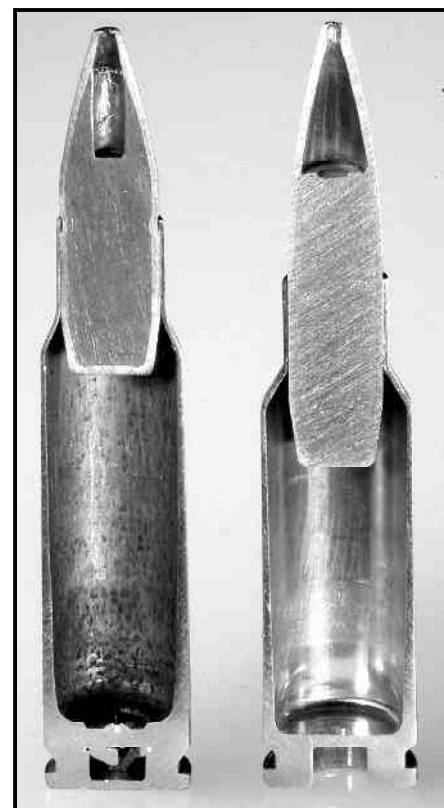
90 grain Speer TNT at 2,978 fps  
120 grain Nosler Ballistic Tip at 2,620 fps  
123 grain Lapua Scenar at 2,650 fps  
129 grain Hornady SST at 2,520 fps

Along with ammunition, Alexander Arms offers rifles with 24 inch and 18.5 inch barrels. Models are offered with two rifling twist options to best suit individual needs. A 1:8 inch twist is offered which is designed specifically for use from 600-1,000 yards. This rate of twist has been found to reduce group size at extended distances. Unfortunately, group size suffers slightly at shorter distances. So for the vast majority of shooters a 1:9 inch twist is recommended. This is optimized for use from 100 to 600 yards.

It will be interesting to see what the future holds for the Grendel. I have been told that Lapua will be offering loaded ammunition in the near future and that Norma will be introducing cartridge cases. It is also interesting to note that the US military has recently taken note of the Grendel and is examining it. A well thought out cartridge, it adds even more versatility to the AR-15 family.

#### Sources

**Alexander Arms LLC**  
US Army Radford Arsenal  
P.O. Box 1  
Radford, VA 24143  
(540) 639-8356



**Right:** While designed for different purposes, both the 6.8x43mm Rem SPC, L, and the 6.5mm Grendel offer a significant performance advantage over the .223 Remington.