

# Assessment of the VEPR Performance During the CMP/NRA High Power Rifle Match At The Black Rifle Convention (BRC) 2002

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**Abstract** – The AK-47 design is commonly associated with the ultimate reliability in military rifles, due to its simplicity and loose tolerance between parts. However, the same characteristics also result in lower accuracy when compared to other military rifles, including the US M16A2 system. In this work, Red Star Arms (RSA) of Columbia, MO, attempts to outline the elusive boundary of the accuracy envelope of an AK-type rifle by using the NRA high power rifle match as the proving ground. The author is a new high power rifle shooter with some experience in both the DCM AR15 and the NM M1A rifles. The author is sponsored by RSA to conduct the test and provide feedback that may be used to determine the needed improvements to give an AK-type rifle the competitive edge. For this stage, the VEPR II in 5.56 NATO (.223 Remington) is selected as the test platform. A few modifications are done on the VEPR to improve the rifle performance, including the use of the RSA fully adjustable trigger.

## I. INTRODUCTION

### I.1 Background

For most of us, there is no doubt that the AK platform is a highly reliable and rugged design for a rigorous field application. However, most of us tend to accept with complacency the fact that the AK reliability and ruggedness come with a cost: accuracy. Most of us believe that the accuracy of a rack-grade AK is sufficient for what the weapon was originally designed for: medium range assault rifles for infantrymen as support elements in a long formation spearheaded by the heavy armor units such as the main battle tanks (MBT). However, an intriguing question to answer would be how far we can push the accuracy of the AK design? How competitive can it be when shot in a fully regulated match such as the NRA/CMP high power rifle? What improvements need to be done to give an AK the edge it needs to challenge the AR15, M1A and M1 Garand in the high power arena? Can this be done? These are the questions many of us have asked in one form or another, yet very few information is available on the outer boundary of the so called *accuracy envelope* that shrouds the AK design. RSA is determined to find this envelope and push it further. By knowing this envelope and how far you can push it, it is hoped that we will be able to determine the answers to the questions posed previously. As the proving ground, RSA selected the NRA/CMP high power rifle match to be held at the PASA Park as part of the activities programmed for the Black Rifle Convention (BRC) 2002, at Nebo, Illinois. This report is organized as follows: Section II covers the practice and preparations for both the shooter and the rifle, Section III discusses the layout of the PASA Park high power rifle range and the course of the match, Section IV covers the shooter's assessment on various technical issues on the VEPR rifle and his views on what needs to be done to address these issues, and Section V presents the shooter's conclusions, and

suggestions for the next stage of the project. Section VI contains acknowledgements to all parties involved.

### I.2 Test Platform

Most AK-type rifles available in the US today are aftermarket products manufactured for US exports by some cash-strapped industries in various former eastern bloc countries. Some AK rifles are known to be of better quality than others. Among these are the Chinese Polytech, the Bulgarian SLR, the Yugoslavian, and the recently improved VEPR II imported from Russia by Robinson Arms. RSA chose the VEPR II in 223 Remington for its accuracy as claimed by Robinson Arms. The rifle has a 1x9 20" chrome-lined barrel, comparable to a rack-grade AR15 rifles. The barrel is also heavier than the standard AK barrel. The receiver used is an RPK-type receiver, which is known to be stronger and heavier than standard AKM stamped receiver. The VEPR II also comes with an RPK-type rear sight with some windage adjustability. The rifle weights a little more than 9 lbs without loaded magazine making it one of the heaviest AK rifle available in the US market today.

### I.3 Shooter

The shooter approached by RSA to assist in this project is a new high power rifle shooter who resides in the same town as RSA. The shooter is just starting his 2<sup>nd</sup> seasons in high power rifle and had just received his first qualification card, for *expert* class, from the NRA in January of 2002. He owns both DCM AR15 rifles and a NM M1A rifle, both of which are suitable for service rifle competition. However, he shoots mainly the DCM AR15 because it is more economical to purchase or reload the .223 match ammunition than the 308. His shooting backgrounds goes back to his Junior High School years where he shot match air rifle competitions for 5 years till his graduation from High School. While doing his MS program at the University of Missouri-Columbia (UMC) in mid 1990s, he was recruited by the UMC rifle and pistol team and was assigned to the rifle team. He stayed with the UMC rifle team till the completion of his MS degree. As a computer engineer who is finishing up his Ph.D. degree in Computer Engineering and does research for living, the shooter views the AK accuracy project proposed by RSA as an intriguing problem to solve. He gladly took part in this project mainly due to his familiarity with the ballistics of the .223 caliber and his curiosity to find out the true potentials of the AK design for accurate match shooting application. By no means that this shooter is the most qualified individual to address the questions posed here. His shooting experience and firearm

knowledge is still very limited. Yet, he is willing to take the project as a learning experience in his attempt to improve his marksmanship skills and his knowledge of other weapon systems, namely the AK-47 design.

## II. PRACTICE AND PREPARATIONS

The shooter received the VEPR II rifle in early May 2002. At first he was asked to simply shoot the rifle and give RSA his opinion of the rifle's performance. As any AR15 shooters out there, he was initially very skeptical and expected the VEPR to perform just the same as any other AK he had shot before.

### II.1 Shooter's Basic Equipments

At the time the project was started, the shooter already had at his disposal a tapered ventilated hardback model heavy cordura shooting coat from *Creedmoor*, a leather shooting glove and a shooting mat from *Freeland*, a sight black spray from *Birchwood & Casey*, and a *Burris Landmark 15-45x 60mm* spotting scope mounted on a tripod based scope mount from *Freeland*. For practice ammo, he used the *Spanish Santa Barbara SS109 5.56* NATO ammo (SB-SS109) with 62-grain tungsten core bullet, chronographed at 3150-3200 fps muzzle velocity out of his DCM AR15 rifles. For rifle support, he used an adjustable nylon sling from *Uncle Mike's*. The sling came with a pair of quick detachable swivels that fit nicely on the swivel studs already mounted on the VEPR II rifle. The target used was the NRA SR-1 200-yard reduced target for off-hand position and rapid fire standing-to-sitting, the SR-21 300-yard reduced target for rapid fire standing-to-prone, and the MR-31 600 yard reduced target for slow fire prone. All these targets are the reduced versions for use at 100-yard ranges. The range facility used was the Rocky Fork shooting range, located just 15 miles north of Columbia, MO. The range offers firing lines for 25, 50 and 100 yards. For this project, the rifle was to be tested at the 100-yard line.

### II.2 Sling and Swivel Issues

Due to the tight sling tension used during prone position, after about 150 rounds of practice, the forward sling swivel snapped. The sling swivel from *Uncle Mike's* is a good quality carry swivel, however it was never designed to be used for high power application where a prolong use of the sling support is part of the game and a very tight sling tension is not uncommon. Within the next 50 rounds after the swivel failure, the screws that kept the nylon sling together lost its grip after the nylon material stretched too much. The two incidents prompted the shooter to request RSA to come up with a better sling and, if possible, a stronger sling swivel. To answer this problem, RSA ordered a 54" heavy NM military sling from *Turner Saddlery*, which is a common household name among high power shooters. Neither the shooter nor RSA ever came up with a better swivel, however the shooter maintained several spare swivels in his bag and installed a brand new one just before the match.

### II.3 Ammunition

The Spanish Santa Barbara SS109 ammo is a fairly accurate ammo for practice. The shooter had shot several local 200-yard matches using this ammo out of his DCM AR15 rifle obtaining fairly respectable results. Shooting a 94% score at 100 and 200 yards using this ammo is not that uncommon. However, RSA felt that we needed better ammo to enhance the accuracy potential of the VEPR. The shooter recommended the 69-grain *Sierra Match King* loaded by *Black Hills*. Toward the second half of May, RSA ordered 500 rounds of this ammo from Tommy Haskins at *Georgia Precision Incorporated* to supply the shooter with ample ammo for both practice and the match itself.

### II.4 Sight Black

The sight black spray used by the shooter worked fine. Except that it leaves too much residue on the sight after frequent applications. RSA went ahead and ordered a carbide lamp sight black from *Creedmoor* which is known to be the old fashion way to reduce the glare on the sights. After some searching, the shooter finally was able to obtain adequate amount of *carbide phosphate* to operate the lamp as expected. The carbide lamp does provide a thin even layer of black carbon on the sights without leaving much residue at all as in the case of the spray sight black. However, later we learned that the spray sight black played an important role in reducing the glare off the entire top portion of the rifle that had become excessive due to the eastward orientation of the PASA range and the 8:30 AM relay where the VEPR was to compete.

### II.4 Practice Methods and Schedule

The first outings with the VEPR took place on May 04, 2002, at 5 PM. The shooter fired from the prone position at an MR-31 target with a full size SR-1 target as the backer. The sight picture used was a flat tire, since he found it hard to do a consistent 6 o'clock hold with the thick and round front sight post on the VEPR. The first round was in the 7 ring at 7 o'clock direction. Single loading the rifle, he fired the second round, performed a shot follow up, and took a peek through the spotting scope. The second shot hit about ¼" to the right of the first shot. Not quite what he had expected, he put the rifle down, stood up and took a few steps back. He was not quite sure what kind of AK is capable of doing a shotgroup like that. Admittedly, a two round group is not enough to gauge the accuracy of a rifle. But from his experience shooting more than half dozen different AK, he never saw shot placement so close like that as the result of a slow and deliberate well aimed shot using a consistent sight picture. Just a week before, he shot his MAK-90 fitted with the RSA trigger in the first communist-bloc rifle match hosted by the Pioneer gun club, Bates City, MO. For further details please visit the report from this match at <http://www.redstearms.com/pioneer.html>. While his shots were all well controlled, thanks to the RSA trigger, however, the MAK-90 shooting Russian Ulyavnosk ammo

would not group well at all at 200 yards. Even though he realized that the ammo used with the VEPR is far better than the 7.62x39 Ulyavnosk he shot from his MAK-90, however, he just did not believe that the VEPR even had the chance of shooting an MOA shotgroup, not even by a long shot. After all, it was just another AK. So the first two rounds out of the VEPR shocked him deeply.

The shooter continued the day shooting a 50 round high power course from 4 positions. The total score from this practice was 448-5x (89.6%), which was far better than what he thought the VEPR could do. Considering that he normally shoots at 93-95% using his DCM AR15 rifle, the score he just shot with the VEPR was phenomenal, especially if we compare the many advantages that the DCM AR15 has over the VEPR. However, this score was shot at a fixed range, where all positions were shot from the same distance. In a full course match, a shooter must shoot at the 200, 300 and 600-yard lines, and the primitive sight system on the VEPR would simply make it all but impossible for a shooter to be competitive against shooters shooting a weapon system with such a finely adjustable sight system as the DCM AR15 rifle. He reported his findings to RSA, and they were just as shocked as he was. A detailed report on the VEPR's first trial is available at <http://www.redstarmarms.com/VEPR%20High%20Power.html>.

On average, the shooter went out to the range between 2-3 times a week, expending between 60 to 80 rounds. He normally shot a 50-round high power course, and use the excess ammo to experiment with the rifle in his attempt to familiarize himself with the shooting behavior of the VEPR. Just before leaving for BRC, he had expended close to 800 rounds of ammo in 4 weeks of practice. The practice time was chosen around 4 PM or later, where the sun would be position just to his right and there would be enough sunlight illuminating the target. The range at Rocky Fork (also known as the Finger Lake) is oriented to the south, which is less than ideal from the perspective of a high power shooter (the sun will be somewhat in front of the shooter). The most ideal range orientation for high power is due north, which would position the sun behind the shooter and shining at the target all the time throughout the day. However, Rocky Fork was the closest public range available and its proximity to his work place allowed him to sneaked out a little early and be at the range by 5 PM. Another advantage for shooting at 4-5 PM using a south oriented shooting range, is that it would create a similar position of the sun with respect of the shooter (to his right) if the shooter is to shoot at a north oriented shooting range at 8 AM. Another practice report is available at

<http://www.redstarmarms.com/VEPR%20High%20Power2.html>.

Based on his experience shooting his DCM AR15 rifle at both 100 and 200-yard range, the shooter anticipated the 100-yard zero to be 1.5-2 MOA lower than the 200-yard zero. However, this was a totally different rifle, hence confirming the zero for 200 yards range was necessary before taking the VEPR to the match. On May 26, the shooter participated in the CMP Garand match at Pioneer Gun Club, Bates City, MO. This range is facing north, a very ideal orientation for high power shooting. The match was

shot from 200 yards, and the shooter managed to obtain a special permission to use the range after the match was concluded, even though he was not a member of Pioneer GC. He had just enough time to shoot 10 rounds from prone position. At this point, he had been shooting using the center-mass hold rather than the flat-tire hold. The change was required since the modified front sight post was then used in the VEPR. With only ½ turn per adjustment available, he was having problem getting the rifle to zero on the X-ring by maintaining the flat-tire or 6 o'clock hold. The center-mass hold brought the zero closer to the X-ring, hence it was adopted. He adjusted the rear elevation setting to 200 meters before shooting, and the target used was an MR-52 600 yards reduced target. From the prone position, the first round was shot using the center-mass hold. It was 1:30 PM and the sun was very bright. Neither he nor his coach could spot where the round hit. He then fired the second round using the flat-tire hold trying to see how much elevation shift he could get by varying his sight pictures. The shooter was able to spot the second round because it was in the 6 ring at 7 o'clock just outside the black. The flat-tire hold was hitting too low. So there was a good chance that the first round was in the black somewhere. Just before he shot the 3<sup>rd</sup> round, his coach managed to spot the first round. It was in the 10 ring at 4 o'clock. The shooter proceeded with the 3<sup>rd</sup> round shooting it by holding his sight picture a little higher than the center-mass hold, but did not cover the entire black. The 3<sup>rd</sup> round was found to be in the 8 ring at 2 o'clock. Due to the time limit given to him by the Pioneer officials, he proceeded shooting the last 7 rounds of Black Hills 69 grain Sierra Match King using the center-mass hold without pausing to spot the shot placement, hoping to learn how consistent the rifle-shooter-ammo combination from the prone position at 200 yards. After the target was retrieved, all parties present were surprised to find out that there are 7 shots, including the first round shot using the center-mass hold, nicely formed a 2.75" diameter group (center-to-center) located about 2" lower and 1" to the right from the X-ring. The target from this trial is shown in Fig. 1. One of the last 7 rounds he shot was a flier that landed about 2" further to the right from the rest of the shots. The next question was how to translate the zero to the X-ring. There was no exact numbers to be used here. To make matters worse, he would need to shoot the rifle again at 200 yards once he made the adjustments, and he did not have access to any 200-yard range within reasonable driving distance. He was hoping that PASA would open the range for non-member competitors to shoot practice rounds the day before the match, as many ranges do. Fig. 2 shows our shooter during the first 200-yard trial at Pioneer rifle range.

## II.5 Sight Adjustments and Familiarization

The shooter experimented with various sight pictures for different positions, while familiarizing himself with the sight system on the VEPR. The RPK rear sight is windage adjustable, however, how much the point of impact (POI)

will be affected by each turn of the windage dial was not known. By trial and error, he concluded that the rear sight windage dial was about 1-2 MOA per click. However, he later found that the windage may be shifted by as much as 4 MOA per click. He also noticed that the rear sight leaf was not tightly attached to the sight mount. You could easily wiggle the rear sight laterally by hand, which made fixing the zero windage almost impossible.



**Fig. 1** The results from 200-yard trial at Pioneer range, notice the 7-shot cluster forming a nice 2.75" group about 2" low and 1" right of the X-ring. The shot group was achieved using the center-mass hold shot from sling supported prone position.

The front sight adjustment was used to raise or lower the POI. A CW rotation on the front sight post would lower the post, hence raising the POI on target. A CCW rotation would cause just the opposite. The question was how many MOA of elevation adjustment could you get from one full rotation on the front sight post. His initial experiments yielded that one full rotation on the front sight would cause the POI to shift by about 5 MOA at 100 yards. Later on, he found someone claiming that the AK front sight thread was designed to give 8 MOA elevation adjustment per full rotation. However, the original AK barrel is only 16" long, while the VEPR has a 20" barrel, hence a longer sight radius. The same amount of height adjustment applied on the front sight post would have more effect on the rifle with a shorter sight radius. Hence, he believed that the 5 MOA per rotation on the VEPR is conceivable. Nevertheless, all these numbers were empirical in nature, which heavily dependent on the many conditions such as the lighting, wind, ammo, position of the sun, etc. Hence, the shooter used these numbers just as a set of hypothesis to help him getting the zero he needed.

## II.6 Modifications

### Front Sight

The first modification requested by the shooter was to machine off the round original front sight post into a square cross-section

that resembled the AR15 NM sight. It was hoped that a square front sight post would provide a clearer sight picture. The width of each side was to be 0.052", identical to the front sight used in the shooter's DCM AR15. After the match, the shooter realized that the 0.052" front sight post used on the VEPR did look smaller than the same width sight post used in his DCM AR15. This is caused by the difference in position of the front sight housing between the two rifles. The AR15 front sight housing is much closer to the shooter's eye than the VEPR's front sight housing. RSA modified three front sight posts per the shooter's specifications. Unfortunately, all these posts turned into a rectangle shape cross-section rather than the desired square. RSA concluded that they needed to make an AK NM front sight post from scratch to allow them better control during the machining process. But for now, the three modified front sight posts are the ones to use in the rifle. The shooter decided to use the smaller side of the rectangle, which afforded him an increment of 1/2 turn for elevation adjustment, roughly 2.5 MOA elevation shift for each adjustment step. Much too coarse for a fine match shooting, but the shooter must make do with what he had. On top of that, the modified front sight post is not centered correctly, hence there was a noticeable change in windage every time the front sight post was rotated so that the opposite side of the post now facing the shooter. With these limitations, he was hoping to get a good zero for one position, and apply different sight pictures for the other positions. This is not what his coaches told him to do starting from his air rifle day, to his smallbore rifle day, to his current days as a high power shooter. He was accustomed to hold the same sight picture for all positions, and to adjust the sight to modify his zero as he moves from one position to the next. The VEPR did not have this luxury, and the need for memorizing what sight picture to use for various shooting positions is simply an extra thing that high power shooter can live without. Even worse, the shooter also learned that there is a strong possibility that he may be forced to use Kentucky windage and elevation in the even of strong wind or rapidly changing lighting conditions. With its current configurations, the VEPR was a very demanding rifle to shoot, not only physically (less than ideal ergonomic), but also mentally, since the shooter must be aware of the characteristics of the rifle in various shooting conditions and must be resourceful enough to compensate for the deficiencies of its sight system.

### Rear Sight

As previously stated, the rear sight on the VEPR had too much lateral movement, which gravely affected its windage zero. To alleviate this problem, the shooter devised a small strip of hard plastic as a shim that would reduce the lateral play in the rear sight leaf. He prepared several strips of shim, because the shim wore out very quickly as the rifle got hot.

### *Muzzle Crown*

This VEPR was acquired by RSA during the Knob Creek shoot in April. When RSA got the rifle, the muzzle crown was slightly damaged. The expert at RSA/Power Cutoms shop gave it a new competition-type crown.

### *Trigger*

When the shooter first received the rifle, the trigger was set to pull as a two-stage with a very light second stage let-off (just above 3 lbs.). Having shot service rifle with a 4.5 lbs trigger, the shooter requested RSA to readjust the trigger to mimic the pull characteristics of one of his DCM AR15 rifles. RSA performed the modification with the DCM AR15 rifle standing by as a sample. The new trigger setting is a two-stage pull with 4.7 lbs second stage let-off and short first stage. We then used a penetrating grade lock-tite (green) to secure all set screws in place. It is important to note that the penetrating grade lock-tite is a very thin liquid form, which can be difficult to control especially if you have to apply it in a small working area. The safest way to apply the penetrating lock-tite is by first removing both the trigger and disconnect off the rifle and apply the lock-tite separately. A simple spill of this lock-tite while the trigger is still fully assembled in the rifle is likely to cause the trigger to freeze and end up costing you more time to remove the trigger assemblies and clean them up.



**Fig. 2** The author conducting the first 200-yard trial at Pioneer range, Bates City, MO, one week before the match.

## III. THE BLACK RIFLE CONVENTION

### III.1 PASA Park High Power Rifle Range: The Silver Star

The High Power rifle competition was to be held at the Silver Star high power rifle range, PASA Park, just a few miles outside Barry, IL. The rifle range has no target pit, hence shooters must rely on their spotting scope to check for hits. The range starts at 100 yards and goes all the way to 600 yards. The shooter arrived at PASA around 12:30 PM on Friday, May 31. He had expected

the range to be open for competitors who wished to zero their rifles. However, there was nobody to be found both at the rifle range and the clubhouse. He was happy to find out that the range has a covered firing position with chicken wire divider in between positions. This put his mind at ease immediately as one of his concerns was hitting other shooters with hot brass ejected from the VEPR. As with any Kalashnikov rifle, the VEPR overkills in terms of the amount of gas used to cycle the rifle. Spent brass is ejected violently up to 25 feet away or more to several directions ranging from the shooter's 2 o'clock to 4 o'clock directions.

The shooter found the grass at the range very high. Too high to With the match less than 24 hours away, they still had not mowed the grass. Our shooter took one of the firing positions and assumed the prone position. He was unable to see the target due to the grass. He was also very anxious about his 200-yard zero, and he would like to shoot a few practice rounds to readjust his zero if necessary. However, he could not find any club official/member there to inquire or obtain permission to use the range. The club bylaws he read at the clubhouse strictly prohibit non-members from using any firearm in their facilities. He was eager to practice, but did not wish to offend the host either.

The shooter then tried to determine the orientation of the range. By observing his shadow under the sun, it did not seem that the range was positioned in the ideal South-to-North orientation. The shooter did not have a compass with him, but he suspected that the range was facing east. A local resident who happened to be passing by confirmed his suspicion. East. The high power range is facing east. He was going to shoot in the first relay at 8:30 AM the next morning facing east, right into the sun. He was terribly upset with the range positioning. He selected to shoot the 8:30 AM relay based on his experience shooting other matches in ranges facing north, where the time of the relay did not give any advantage to the shooters in one relay over shooters in other relays. Had he known that the PASA high power range was facing east, he would have chosen the 12:30 relay to avoid having the sun shining on his face and the target being blanketed by its own shadow (the sun would be to the rear of the target from the shooter's perspective). He blamed himself for not asking the BRC people online which way the range was facing. He was under the assumption that a well-known club like PASA with the Master tournament programmed in its calendar would know how to build a good rifle range. Obviously his assumption was false. Aside from being upset with his findings of the range, he was more worried about his 200-yard zero.

After wandering for a half hour or so, the shooter decided to leave PASA Park and proceeded to the Heartland Lodge where the BRC registration station was located. Upon his arrival, he informed the organizer about the grass at the PASA rifle range, and they responded immediately. The

BRC official contacted PASA and stated that the grass would be mowed that afternoon. Our shooter was able to work out a lodging-transportation arrangement with a fellow high power shooter from Michigan who would shoot in the first relay (8:30 AM). The gentleman was representing EoTech at the BRC, but he was a long time high power shooter who is currently active in smallbore match rifle competition. For the high power match the next day, he was going to shoot either his NM M1A. However, EoTech asked him to study the possibility of shooting their Bushmaster dissipator carbine equipped with EoTech Hologight. Apparently, EoTech would like to see how well their sight would perform in the competitive arena such as the high power rifle.

### III.2 Late Practice at the PASA Range

At the end of the day, both our shooter and the gentleman from Michigan agreed to go to the PASA range to see if practice was possible. When they arrived, there were several shooters from BRC who were not members of PASA. They were zeroing their rifles for the match the next day. The shooter was concerned with the zero for sitting and off-hand at 200 yards. He felt that the trial conducted at Pioneer the previous week should give him a decent zero for the prone position. After a few rounds, he learned that his POI while sitting was about 6"-8" higher than his POI from prone, at 200 yards. He was reluctant to adjust either the front sight or the rear sight as the sun was setting fast. He was not happy with the looming possibility of his having to use *Kentucky* windage and elevation during the match. To place his shots in the black from sitting, he had to use a very low 6 o'clock hold, aiming about 6-8" below the target 6 o'clock line. By the time he learned how much *Kentucky* windage and elevation he would need, the sun was already down. There was no opportunity to confirm his off-hand zero. For this match, he had brought two scopes: a *Kowa TSN-1* with 25x fixed power (a loaner from another high power shooter), and a *Burriss Landmark* with up to 45x variable power. He was hoping to take advantage of the *Kowa's* superior optics to spot the shots at 200 yards. Unfortunately, the magnification on the *Kowa* was too small for spotting 223 holes from 200 yards. Reluctantly, the shooter switched to his *Burriss Landmark*.

### III.3 Thoughts Over The Match Strategy

Over the night, the shooter kept pondering on the elevation difference between sitting and prone positions. Finally, he decided to try to shoot the rapid fire sitting position with the rear sight set back to 100 meters setting (it was at the 200-meter setting during the practice session earlier). It sounded odd to him that he had to set the sight back to 100-meter setting so that he could use the 6 o'clock hold for the sitting position, and switched it back to 200-meter setting for the prone position. The AK's rudimentary sight system really puts the shooter's resourcefulness to the test. On top of that, the shooter still could not escape his DCM AR15-mind-set where the zeros for all positions vary only by a few clicks in either direction. This is due to the excellent ergonomic of the AR15 rifle that allows the shooter to maintain the same sight picture between positions, because the rifle sight is fine enough to be adjusted to alter the zero to fit your sight picture

for a different shooting position. With an AR15, all these can be done very quickly, easily, accurately and consistently. Even in the middle of a match, a shooter knows how much his POI will change for each click he applies on the windage or elevation drum. With the VEPR or any AK with standard sight system, this will not be possible. Here the shooters are likely to follow the rifle's wish rather than the rifle follows the shooter's wish. At this time our shooter was going through his secondary action plan just in case moving the rear sight back to 100-meter setting would not work. He was replaying in his mind the last *Kentucky* windage and elevation he used during the practice session earlier. But the very prospect of using the *Kentucky* windage and elevation really bothered him. The words just never came up during his shooting tenure with the DCM AR15. He wished that he had had access to a 200-yard range early on. All the practices he had done with the rifle at 100 yards (the only range he had access to) seemed to bear no fruit whatsoever. Tired and frustrated, the shooter remained determined to give the VEPR a chance to show its worth.

### III.4 The Match

The shooter and his fellow shooter from Michigan hit the PASA Silver Star range just after 7 AM on Saturday, June 01, 2002. They wanted to be there early to allow their systems to reach steady states before the match began at 8:30. There were some overcast with thunders at some distance away. The two shooters were happy with the possibility that they might shoot the match that morning without the sun shining on their face. But the overcast went away and the sun now shined directly toward the shooters.

The match officials informed them that they were allowed 5 minutes of sighting period with unlimited number of sighter rounds. The shooter was elated about this as he needed to test his theory of sliding the rear sight back to 100-meter setting for sitting position with the 6 o'clock hold. He was hoping that his windage setting would not be too sensitive to position changes.

RSA provided the shooter a long brimmed shooting hat with two flaps on the side. The hat worked very well in protecting the shooter's vision against the bright sunlight. The high power shooter from Michigan came up with an excellent idea: spray the whole upper of the rifle with the sight black to kill the glare. He did it to his NM M1A, and our shooter followed by liberally spraying the top portion of the VEPR with sight black. He then fired up his carbide lamp and burned both the front and rear sight of the VEPR. While the acetylene gas was still going, he also burned the front sight on the next shooter's NM M1A. Now the VEPR was all covered with carbon from muzzle to the end of top cover. But it worked, no glare whatsoever coming from the rifle. Fig. 3 shows the brightly-lit firing line just before the first relay.

### *The Sighters*

They used a 600 yard reduced target (MR-52) for the sighters. The shooter tried to repeat the shot placement he made a week before at Pioneer range, by shooting 4 rounds from a sling supported prone using a center-mass hold. He was having problem seeing the holes with the sunlight coming from behind the target. Finally, he was able to detect a shotgroup at 8 and 7 ring at 12 o'clock direction. He was shooting higher in this range even though he was using exactly the same setup as he did when during the trial at Pioneer the week before. He then switched to a 6 o'clock hold. His first round hit the 7 ring at 2:30. Suspecting that his hold was not good, he shot again and hit the same spot just ½ inch away from the last round. He then moved the rear sight one click left and shot one more round. It hit the 9 ring at 2 o'clock. OK, that was good enough for this rifle. He should have shot one more round to reconfirm the zero, but time was running out and he needed to test the zero for sitting position. He assumed the sitting position, adjusted the rear elevation back to 100-meter and shot two rounds using 6 o'clock hold. Both shots hit the 10 ring and he was satisfied. The sighter period was over, and he still had not confirmed his off-hand zero. However, he was less worried about his off-hand zero now since he just found a good zero for his sitting position, which should be close to the off-hand zero. This is true at least in his DCM AR15 where he just needed to adjust the elevation up by 1 MOA or so. With the VEPR, it should be in the black if he was to use the same sight setup as for the sitting position. He anticipated it to be higher, but it should not be more than 2"-3". Knowing that the black for off-hand is 13" in diameter, he did not feel that it would be too much trouble finding his zero for off-hand at this point.

### *Off-Hand*

The shooter felt good going into the off-hand stage of the match. Ten rounds for 10 minutes, single load. He had worked hard trying to make up for the time lost for single loading the VEPR. The single load routine he had developed for the VEPR is the following: place the rifle butt on the shooting stool in front of him, muzzle pointing up and forward, using his right hand he removes the magazine and hands it over to the left hand, the left hand now holds both the rifle (by the handguard) and the magazine, the right hand then retrieves a new cartridge from the ammo pouch hanging on the shooter's coat pocket, load the new round to the magazine, take the magazine off the left hand and insert it back into the rifle, pick up the rifle off the stool, with the muzzle pointing down range charge the weapon, and he is ready for the next shot. It took him about 4-5 seconds longer to single load the VEPR than the DCM AR15 equipped with a single load magazine (with a special follower that allows you to simply drop the new round into the ejection port and close the bolt). So overall, a shooter with an AK type rifle will lose about 40-50 seconds of his shooting time than those with DCM AR15.

The shooter was worried when he could not see the result of his first shot. The sun was so bright that he could not see the ring on his target. This is the first experience for our shooter shooting in a range due east. He was caught unprepared and had no idea what

to look for or how to deal with the excessive sunlight hitting his spotting scope. Accustomed to shooting in ranges facing either north or south, he assumed that the bullet holes in the black were just too hard for him to see. Since he could not detect any bullet holes in the white, he immediately assumed that all his shots were in the black. His sight picture looked good when he squeezed the trigger, therefore he felt that he must have a decent shotgroup. He maintained the 6 o'clock hold for the first 6 rounds. With 4 minutes left, he felt that he was going at a good pace. Then he pulled a shot down. Regretting his lack of trigger control, he took a peek thru the Burris scope. To his shock, there was a hole in the black, a nine at 3 o'clock. Apparently, the target backer was shot-off behind the black, allowing the sunlight to shine at the rear portion of the target directly. Any bullet hole in the black area would be quite visible as the high contrast exists between the surrounding black area and a bright ray of sunlight coming through the bullet hole. However, this is not the case when you hit the white area of the target. The backer may not have been shot off, or, there is very little contrast between the bullet holes and the white surroundings. All these phenomenons were new to the shooter, as he had always shot at ranges facing either North or South. At ranges facing north or south, the sunlight hits the front side of the target, making the holes in the white area easier to spot than those in the black. All these analysis went thru his mind and a chill went up his spine. He might have been shooting too high all these time and never knew it because he could not spot the hits. With a low quality optics like the Burris Landmark, these holes seen at 8:40 AM were next to impossible to spot. With have 3 rounds left, he decided to lower his sight picture. All three shots were all in the black, 2 tens and 1 nine, complementing the nine he shot before. When the target was retrieved he was shocked to learn that the first 6 shots were all high (as he had feared), 5 were in the 7 ring at 12 o'clock, and one was in the 6 ring also at 12 o'clock. The shotgroup was good for off-hand. They could easily be 9s and 10s judged by the size of the shotgroup, had the shooter learned about his elevation problem early on. The shooter was very disappointed with the result and blamed himself for being unprepared to shoot in those conditions. However, it must be noted, that the time of the relay paired with the range orientation, certainly makes it more challenging to shooters to give their best performance. For someone who has never shot a match under these conditions, the situation is even harder. The off-hand score was a low 79/100, which was much lower than his regular score of high 80s and low 90s with the VEPR for this position.

### *Rapid Sitting*

The shooter tried to pull himself together after the debacle during the off-hand stage. For the sitting position, at least he had the confidence that his zero was true and he was capable of shooting a respectable score. He adjusted his Turner sling the "Marine way" as taught to him by a Master class shooter

who was a member of the Navy rifle team for many years. The Turner NM sling was a good sling, however, a few cracks started forming in the area where the sling went around the swivel. It is a very high stress area, but a new Turner NM sling should not begin to crack after just 200-300 rounds of high power shooting. The shooter adjusted the Turner sling to hole #6 for sitting, one hole tighter than for the prone (hole #7). He used the prep period to get into position and dry fired the VEPR a few times. He checked my rear sight once again, making sure it was at the 100-meter setting. It was hard for him to comprehend shooting at 200 yards using 100 yards setting and still had to use a 6 o'clock hold. This shows how sensitive the shot placement on the VEPR to changes in shooter's position. We will cover this more later.

The 3-minute prep period was up. "Shooters, STAND!!" The shooter was accustomed to the cross-legged position, and it had always been a challenge for him to stand up without breaking his foot placement. He stood up with his legs twisted, ready to drop into a cross-legged position in one second flat. When the FIRE instruction was given, he immediately dropped into the previously assumed sitting position, charged the VEPR, brought the stock to his shoulder, and locked into position. He tried to regulate his breathing by taking two long breaths while allowing his shooting eye to acquire the sight picture. He had a blinder covering his left eye, allowing him to shoot with both eyes open. Everything felt good, he squeezed off the first two rounds at a good pace, with a semi-forced breathing in between shots. He had practiced enough sitting that allowed him enough time to peek thru the spotting scope to spot for the first two rounds. They were in the black, a 10 and a 9. Now he knew that his 6 o'clock sight picture worked with this zero. He dropped the empty magazine, grabbed the second magazine loaded with 8 rounds and quickly inserted it into the rifle. After charging the weapon, the shooter locked back into his shooting position. He had a good pace overall, with one possible pulled shot to the left, but no time to think about that, he had to keep the pace going constantly. He finished all 10 rounds in just about 55 seconds, 5 seconds earlier than the allotted time of 60 seconds. Looking thru the spotter, he was happy to see the majority of the shots were in the black with at least 4 shots in the 10 ring. When the target came back, he found 5 shots in the 10 ring, 4 in the 9 ring, and one in the 8 ring at 10 o'clock (the one I called as a pulled shot). Total score for this position was 94/100. He had shot as high as 99/100 with the VEPR in this position, but given the conditions he had at the time of the match, the score was still fairly decent and respectable.

The sitting position with the VEPR has always given the shooter a bruised right cheek. From shooting AR15, M1 and M1A, he likes to have his cheek-weld point with the stock very close to the receiver. In fact, he likes the right edge of his nose to touch the charging handle of the AR15 as an indicator that he has a consistent cheek-weld for each shot. Old habit dies hard, so this carries into the VEPR. Unfortunately, for the sitting position, he has to lean his head forward and to the right in an attempt to clear his prescription glasses just above the receiver cover latch. But doing this also exposes his right cheek immediately below the

glasses frame to the mercy of the receiver cover latch. In fact, the latch is pressed against his cheek. During each shot, the latch gives his cheek an unfriendly jolt that leaves a painful sensation that lasted for the next 5 minutes or so. After doing sitting so much this past week, he started seeing a reddish bruised spot on his right cheek.

#### *Rapid Prone*

Immediately after he secured his rifle from sitting position, the shooter readjusted the rear sight back to the 200-meter setting for the next position: rapid prone. The Turner sling was also readjusted to hole #7 and the sling keeper on his Creedmoor shooting coat was also tightened up a notch. He likes to wear the sling high on his upper left arm. He gave a good pull on the sling to tighten up the sling loop around his upper arm. He prepped the position, and dry fired the weapon a few times. Then the range controller gave the command: "Shooters, STAND!!"

The shooter stood up and positioned himself just at the rear edge of his shooting mat. He placed the rifle butt on his lower right stomach area while leaning a little forward. He closed the blinder on my left eye, allowing his right eye to focus on target while keeping his left eye opened. For the rapid positions, he chose to wear his old crumpled boony hat since he was worried that the long brimmed shooting hat would require an adjustment once he got in position.

FIRE!! The shooter leaned forward and dropped on his knees, moved the rifle butt forward and allowed it to touch the ground first, followed closely by my left elbow. He pulled his right leg up to open up more room for diaphragm for breathing. He charged the weapon and brought the stock to his shoulder with his upper body leaned and twisted to the left (to allow room for rifle butt). Once the rifle butt is secured in place, he locked his position by turning my whole upper body to the right using his right elbow for support. He took two long breaths while his right eye acquired the 6 o'clock sight picture. Just like the routine in rapid fire sitting, he shot two rounds off the first magazine with a forced-breathing in between shots. Peaked thru the scope before going on with the second magazine. The first two shots are in the black, probably in 9 or 10 ring. He recalled his last sight picture and remembered seeing a thin white line between the top of his front sight post and the 6 o'clock bottom of the target. He just reminded himself not to allow the white line to be visible in the next 8 rounds. For this position competitors are given 70 seconds.

At the end of the stage, the shooter spotted numerous holes in the black, mostly in 9 and 10 rings. So it looked like a good shotgroup. He later learned that he had pulled two shots to the left, one was just outside the black in the 7 ring while the other was in the 8 ring. The total score for this position was 90/100. A fairly respectable score given the rifle and sight system used. With the tangent sight of the



AK, it is very challenging trying to reacquire the right sight picture after a shot, and to squeeze off another shot in just around 5 seconds. Having to line up the top of the front sight post and the top of the tangent sight proves more difficult and tricky than what he had anticipated.

### *Slow Fire Prone*

The last stage of the match is the 20-round slow fire prone, single load, in 20 minutes. This is the stage that our shooter had spent most of his time practicing with the VEPR. From the trial at Pioneer, he knew that his zero was off, and he had not determined how to compensate for it. He could either try to adjust the sight, or simply apply necessary Kentucky windage or elevation. By the time the match began, the shooter still had not decided how he was going to handle the zero off-set. This is the biggest mistake he made, and he is still blaming himself for it as this report is being written. If one finds himself in a match shooting a DCM AR15 with ½ minute sight adjustment, and his POI is off the X or the 10 ring, then the shooter would be inclined to adjust his rear sight to shift the POI to the Xring. Any high power shooter would want to maintain a consistent sight picture at all times. Unfortunately, this was exactly the mind-set the shooter had going into this stage of the match. He simply “forgot” that he was shooting an AK, and the AK did not have a fine enough sight adjustment to afford him the POI correction he wanted. The shooter would be better off to apply some forms of Kentucky windage immediately after finding out that his POI was off the X-ring. Instead, he tried to adjust his sight as he was shooting the match, causing him to spend his rounds to chase his zero, and lost points unnecessarily in the process.

Initially, the shooter was using the 6 o’clock hold. The first round was in the 8 ring at 10 o’clock. With the AR15 mind-set, he moved the rear tangent sight by one click to the right (RPK sight). His second shot was a 7 in 2 o’clock direction. He felt that his sight picture was not perfect when firing the second round, so he shot again using the same sight picture and no sight adjustment. The third round hit just to the right of the second, but it was off the black now, a 6 at 2 o’clock. At this time he realized that he had wasted two rounds trying to find a new zero using a sight system that was never meant to be used in any high accuracy competition shooting. Angry and cursing his own stupidity, he started looking for a new sight picture to compensate for the difference in POI. The KY windage and elevation were put to use immediately. He had to hold over to the left and lower than the original 6 o’clock hold trying to hit the 10-ring. Over the next 5 rounds, he was trying to get comfortable with his new sight picture. No more 7 or 6, but the damage was done. Many of his shots landed in the 10 and 9-ring during the last 10 rounds of the stage. But it was not enough to make up for the lost points. On top of that, the Kentucky windage and elevation is not the best recipe for a new shooter to hit a 3” circle (the 10 ring) from 200 yards away 20 times out of 20 rounds. The Kentucky windage may be good enough for plinking or even making a head shot at an enemy from 200 yards away. You can hit the 8-ring on the MR-52 target and still hit someone in the face from 200 yards. For

slow fire prone, the VEPR ended up with 172/200, which is lower than the 180/200 that the shooter was trying to achieve. This shooter and author requests the reader to remind him the next time the reader sees him, that the VEPR sight is not the same as the sight on a DCM AR15.

### *Overall Results*

The total score for the VEPR, plagued with mistakes of its shooter, was a low 436/500 (87.2%), about 15 points lower than the initial goal set by the shooter. Detailed match results are given in Table 1. From the results listed in Table 1, the VEPR II 223 ranked 11<sup>th</sup> out of 29 scores reported. However, 4 shooters refired the match when there were openings in the 12:30 PM relay. Hence, there were only 25 shooters who competed, and in this case the VEPR would rank 7<sup>th</sup> out of 25 competitors providing that each shooter was allowed to submit only one score for the overall match. Our shooter was not informed that he could refire the match if there were openings in later relays. He would have taken the opportunity and fire the match again using his knowledge gained from shooting the first relay. From the results above, the author conjectures that all four shooters who refire the match ended up with the same or better score than their first ones. The VEPR was the only AK-type rifle that participated in this match. AR15 were the most used rifles in this match. There was at least one NM M1A and one AR15 match rifle (space gun) shot in this match. The score 436 (87.2%) was well within the score range for Sharp Shooter qualification (84% to 89%). The initial objective was to shoot an expert level score (89% to 94%) with 90% set as the objective. Even though the VEPR and its shooter failed to achieve their objective, we still believe that both the rifle and the shooter had shown the accuracy potential of the AK design, considering the difficulties coming from unconfirmed zeros, unfavorable range orientation and the disadvantageous sun position during the match.



**Fig. 3** The Silver Star high power range, PASA Park, just before the first relay at 8:30 AM. Notice the sunlight coming straight at the shooters positions.

**Table 1** Match results: High Power Rifle CMP Match, Black Rifle Convention, June 1, 2002, PASA PARK, Barry, IL.

	Competitor Name	Rifle Category	Competitor Qualification	Off-Hand	Rapid Sitting	Rapid Prone	Slow Prone	Total
1	Joe Bruch	SR	EX	94-1	97-1	99-1	188-4	478-7
2	Greg Martin	SR	MA	87-1	99-2	97-2	190-5	473-10
3	Austin Martin	SR	SS	89	81-2	97-4	200-7	467-13
4	Austin Martin	SR	SS	86	93	95-1	193-6	467-7
5	Donavon Vannett	SR	EX	84-1	88	96-1	185-3	453-6
6	Joe Bruch	SR	EX	88	97	99-1	168-2	452-3
7	Greg Martin	SR	MA	87	96-3	77	191-4	451-7
8	Steve Bertelli	SR	MK	90	89	90-1	175-4	444-5
9	Donavon Vannett	SR	EX	89-1	84	78	191-7	442-8
10	Dan Schleh	SR	UC	71	91-1	88	187-2	437-3
11	OZ (VEPR II 223)	OR	EX	79	94	90	173	436
12	Ron Sullivan	SR	EX	68	89	95	174-4	426-4
13	Robert Whitehill	SR	UC	80-1	41	64	130	315-1
14	Matt Starr	SR	UC	70	78	62	104	314
15	Troy Gustafson	SR	UC	51	76-1	73	111	311-1
16	Steve Ward	SR	UC	56	68	67	93	284
17	Joey Jones	SR	UC	41	53	43	107	244
18	Steve Edwards	SR	UC	59-1	74	7	102	242-1
19	Nicholas Streit	SR	UC	56	50	30	104-1	240-1
20	Jennifer Schultz	SR	UC	51	39	29	104	223
21	Craig Armstrong	SR	UC	37	58	50	75	220
22	David Wendell	SR	UC	49	65	45	57	216
23	Linda Krause	SR	UC	42	25	62	82	211
24	John Bobo	SR	UC	21	34	54	85	194-1
25	Harvey Smith	SR	UC	28	37	16	36	117
26	Tim Lebesma	SR	UC	31	21	30	30	112
27	Philip Traskaski	SR	UC	16	23	16	29	84
28	Zach Ward	MR	UC	0	39	0	20	59
29	John Roorda	SR	UC	0	0	31	5	36

Rifle Category: SR = Service Rifle (AR15, M1A, M1 only)

MR = Match Rifle

OR = Other Rifle (VEPR rifle is included here)

Shooter Qualification: UC = Unclassified (normally compete with MA shooters, known as MA-UC)

MK = Marksman

SS = Sharp Shooter

EX = Expert

MA = Master

HM = High Master

Positions/Rounds Fired/Time Limit/Maximum Score:

- Off-hand, 10 rounds, single load, 10 minutes, 100-10
- Standing-to-Sitting, 10 rounds (2 + 8), rapid fire, one reload, 60 seconds, 100-10
- Standing-to-prone, 10 rounds (2 + 8), rapid fire, one reload, 70 seconds, 100-10
- Prone, 20 rounds, single load, 20 minutes, 200-20

#### IV. TECHNICAL ASSESSMENT

The shooter is fully aware of the advantages the DCM AR15 rifle has over the VEPR in its current configuration. He also believes that the VEPR, in its current configuration, cannot outperform a DCM AR15, a NM M1A or a NM M1 if both rifles are shot by shooters of the same level of experience and qualification. However, how does the VEPR compare against a standard rack-grade AR15? In the scope of high power rifle competition, we believe that the performance comparison between

the two rifles will be determined by the shooter's expertise and his equipments (shooting coat, shooting glove, sight blacken, sling, etc.). However, if we hold these determining factors equal, we will have to look closely at the design of the two rifles. In this section we will try to assess the difference in design and determine possible advantages one has over the other

##### IV.1 Sight Assessment

A rack grade AR15 with an A2 sight is capable of 1 minute adjustment for both elevation and windage. This

allow shooters to be able to accurately estimate how much “clicks” of adjustment he must give in order to adjust his zero. Such a standard is not commonly known for AK/VEPR sight system. Our shooter even posted a question to the manufacturer of the VEPR rifle asking them how much he would need to adjust his front sight if he wanted to adjust his POI by 2” up and 1” to the left at 200 yards. The manufacturer’s response is a typical “adjust a little bit, then shoot it to see where you hit”, which is not a typical answer an owner of a Bushmaster AR15 A2 rifle would get from Bushmaster if he were to ask the same question about his rifle. The AK/VEPR sight system may be an adequate battle sight, however it is not accurate enough for use as a match sight.

The sight mount on the AR15 is also much more stable than that of the AK/VEPR. The VEPR’s rear sight system has too much lateral movement, which adversely affects the windage setting of the rifle. In our case, we used a piece of hard plastic as a shim to make the rear sight fits more snugly on the sight mount. The plastic shim must be replaced every 100 rounds or so, as the plastic melts due to heat.

The AR15 peep sight also holds an advantage over the AK tangent sight. The peep sight allows shooters to naturally focus their eyes on the front sight post, without having to worry about the rear sight. The peep sight is less demanding and less straining on the eye. It requires less effort to line up the front sight with the target, hence the eye stays focused easier and the sight picture remains clear much longer. Lew Tippie went over these issues after the match with me. He also pointed out that the tangent sight on the AK sight is too small, making it more difficult for the shooter to acquire the front sight post. The size of the tangent sight may also induce a false level between the front sight post and the top of the tangent sight. This will adversely affect the shooter perception of the elevation in his sight picture, causing his shotgroup to open-up vertically both up and down. Our shooter found Tippie’s comments to be right on the money. He had experienced every bit of conditions Lew Tippie described, and now he knew why.

Another issue is the distance between the shooter’s eye and the rear sight. In an AR15, the distance would be as small as 1-2”, in the VEPR it is at least 8-10” away. The distance, compounded with the strain on the eye, will increase the sensitivity of your sight picture with respect of your head and cheek-weld position. In other words, the VEPR’s POI changes a lot depending on the shooter’s cheek-weld position. This is why the VEPR POI changes as much as 68 MOA when switching from prone to sitting or off-hand position (all sight setting unchanged). The shooter’s head position and cheek-weld changes significantly between these three positions. Once again, Lew Tippie confirmed this notion when we talked after the match. According to Lew, changes in POI (hence changes in zero) also occur in AR15 system, however the amount of changes is very small, about 1 MOA or less. Hence, we conclude that for serious target works, the AR15 sight system is far more superior than the

original/standard AK/VEPR sight system. The shooter/author and RSA would like to thank Lew Tippie for his advices.

#### IV.2 Trigger System

The VEPR was fitted with the Red Star Arms adjustable trigger. As requested, RSA adjusted the trigger as a 2-stage, which breaks clean at the average of 4.7 lbs. It has a short first stage and very positive 2<sup>nd</sup> stage. The pull is modeled after a NM M1A and a Bushmaster DCM AR15 rifles owned by the shooter. Once we achieved the desired trigger characteristics, all set screws were given the green penetrating grade lock-tite. Throughout the VEPR project, the VEPR shot more than 750 rounds of SS109 and Black Hills 69 gr. SMK in the last 4 weeks before the match. We believe that the RSA trigger pull is very comparable to a AR15 DCM or NM M1A trigger as verified by many high power shooters who dry fired the RSA trigger on the VEPR. An NM M1A shooter said that if he is blindfolded and given the VEPR with RSA trigger or his NM M1A, he may not be able to tell the difference between the two rifles simply by feeling the trigger pull. For match shooting, the RSA trigger definitely outperforms the standard trigger found on mil-spec AR15.

#### IV.3 Barrel

The VEPR II 223 has a 20” 1x9 twist chrome-lined barrel. It is a common perception that a chrome-lined barrel is usually less accurate than a steel or stainless steel barrel. Chrome-lined barrels are not the first choice for those who are building a match accurized high power rifle. Lew Tippie agreed that the chrome-lined barrel itself has posed an inherent limitation on the accuracy of the VEPR. The current barrel on the VEPR is less than ideal for high power shooting. This is one of the reasons for not comparing the VEPR against DCM AR15 or other NM rifles. However, as we know, milspec AR15, such as rack-grade rifles from Bushmaster, also come with a chrome-lined barrel. Hence it is more fitting to compare the VEPR against a milspec rack grade AR15, at least when we look at the barrel performance. Unfortunately, our shooter has not shot a rack-grade AR15 in a 200-yard high power match before. Hence, we do not have adequate information to compare the accuracy of the VEPR against those of a rack-grade AR15 with chrome-lined barrel. Actually, rack-grade AR15 with chrome-lined barrel were used by many first time shooters during the match. However, we simply cannot use their scores as benchmarks to measure the VEPR’s accuracy because there is a significant gap in experience and equipments between our shooter and those shooting the rack-grade AR15.

#### IV.4 Balance & Ergonomic

As with a rack grade HBAR AR15, the VEPR is not very well balanced. It is front heavy, which makes shooting off-hand more challenging. The DCM AR15 has a counter-

balance weight added to its stock (about 3-3.5 lbs), which shift the center of gravity of the whole rifle back toward the shooter. This makes the rifle easier to shoot for off-hand position. An added counter-balance stock weight may improve the VEPR handling for match application, especially for off-hand shooting. The VEPR II in its current configuration is, perhaps, already one of the heaviest AK-type rifles in the US market today. Some AK enthusiasts may criticize the maneuverability of the rifle as compared against the original AK-47/AK-74 rifles. True, the rifle will not be as handy and maneuverable for tactical application, but the focus here is to find an accurate bullet delivery system capable of hitting a 10" circle from 600 yards away (hopefully, we can get that far). So, weight is not an issue. The extra counter balance weight is currently being designed by RSA and will be added to the VEPR II rifle in the near future.

#### IV.5 Gas System

As with any AK system, the VEPR has a very good operational reliability. But it also means we have too much gas pushing piston, much more than what is needed. The VEPR ejects the spent brass between 15-25 feet away with no constant direction of ejection. With the VEPR, our shooter had to give up the hope of recovering those good LC 01 brass used by Black Hills in their ammo. An adjustable gas system may tone down the recoil on the VEPR and make it more accurate. Another improvement needed is a brass deflector that would prevent the brass from being thrown to 3 o'clock and may hurt the shooter next in line. This is very important as very few high power rifle ranges has a divider in between shooting positions.

#### IV.6 Handguard

Initially, our shooter was under the impression that the VEPR handguard design was resistant to the tight sling tension that most high power shooters regularly subject their rifle. Without a free-floating handguard where the sling swivel is mounted on, the tight sling tension worn during the prone and sitting position may cause the barrel to flex, causing the zero to wander. During initial tests, the shooter did not notice any barrel flexing or wandering zero when a tight sling was used. This does not seem to be the case. The sling swivel on the VEPR is screwed onto a stud attached to the barrel. While the handguard does not afflict any lateral force on the barrel directly (which may cause the barrel to flex to the left as in the case of a rack grade AR15 without free floating handguard tube), however the swivel stud seems to have a pulling effect causing the barrel to flex downward. This may explain why the POI for the prone position (with sling) is always lower than the POI from sitting position (also with sling, but not as tight, and was done in just under 60 seconds), and both previous POIs are still lower than the POI from off-hand position where the barrel experiences no torque whatsoever from the sling. Further thoughts should be given to make the sling stud supported by the handguard and make the barrel free-floating.

## V. CONCLUSIONS AND FUTURE WORKS

The match results prove that an AK-type possesses the accuracy potential required for match application. We believe that the accuracy envelope of the VEPR II 223, in its current configuration, has been clearly defined. Even in the hand of a shooter with limited skills and experience, we have been able to expose the weaknesses of the current VEPR configuration, which, if improved, may push the accuracy envelope of this rifle even more. In the shooter's opinion, the most important improvement needed is:

1. A new sight system capable of ½ minute adjustment for both elevation and windage.
2. A new sight system closer to the shooter's eye.
3. A fine peep sight system
4. Need to determine whether it is necessary to replace the front sight housing with a taller one to balance the increase in height for the new peep sight system.

At this point, the shooter feels that he had accomplished everything he could do with his skills and experience. He also believes that the VEPR needs to be improved based on the list given above before sending it to another high power match. The ultimate test will include shooting a full course high power rifle match at 200, 300 and 600 yards. To verify whether there had been a decrease in marksmanship skill on the shooter's part, which may be responsible for his failure to achieve his initial objective, the shooter went out and shot a 50-round high power course at a nearby 100-yard range the day after the match. He used SS109 ammo and a Bushmaster DCM AR15 rifle, with the same equipments as used when shooting the VEPR. He shot 472-6x (94.4%), which was close to his score from the last NRA sanctioned full-course match shot with the same rifle last year. Hence, he concluded that four weeks of shooting the VEPR did not have any adverse effect on his marksmanship skill with an AR15 type rifle.

## VI. ACKNOWLEDGEMENTS

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