

Silent Hunter Part 3: Testing And Evaluating Centerfire Suppressors

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DPMS 223 Remington AR-15.



Gemtech Quick Detach G5 223 suppressor.

As the saying goes, timing is everything. I was preparing to start testing centerfire suppressors for my final article on suppressors when I received a phone call that would soon change my outlook on gun cleaning products. David Salmonsens, a friend and owner of Stealth Armor Marketing, proceeded to tell me about this great new gun cleaning product, Weapon CLP. After listening to David tell me more intimate details about the product I was certainly intrigued, but I live by the old adage, "If it sounds too good to be true, it isn't!" Over the years, I have tried almost every product on the market. Some were good, a few great, but most met with what I consider dismal failure. The ultimate test of any gun cleaning/lubricating product is how well and how long an AR will function when this product is applied. Although David was very persuasive I can get hard-headed sometimes and I hate to change something that is working for me. About a week later, David called again and I finally agreed to give Weapon CLP a chance.

My first trial of Weapon CLP would test it beyond its primary scope of use. During the previous fall, while carrying an armful of shooting supplies to my range, I lost a SureFire muzzle brake designed to fit over a SureFire quick detach 223 suppressor. Although I had a second SureFire muzzle brake,

the thought of losing such an expensive item sent me searching the surrounding area for days. After a week-long search, I finally declared the brake lost forever. The ensuing winter months were the coldest and wettest on record. In late spring, a friend with a metal detector renewed the search. All those countless hours I spent searching and he finds it in only a few minutes!

Under these circumstances the anodized coating held up remarkably well, but small areas of surface rust were numerous. I took it inside and was going to decide what to do with it when there was a knock on the door. UPS had delivered a package from Centerfire Cleaning Solutions. Inside were two bottles of Weapon CLP (Cleaner, Lubricant, Protectant).

Without any hesitation, I began liberally spraying the inside and outside of the SureFire muzzle brake with Weapon CLP. I sprayed it four to six times per day for four days. Although the muzzle brake was looking good, it was difficult to tell if the Weapon CLP saturated surface was merely hiding the rusted areas or removing them. After thoroughly wiping the muzzle brake of all excess Weapon CLP, I was amazed at what I saw ... or more precisely, what I didn't see. No rust! This couldn't be, so I closely examined the brake under a magnified halogen light. There absolutely was no rust and the brake looked

almost new. Although the muzzle brake was completely dry and devoid of any excess Weapon CLP, the surface of the brake had a slickness which could be easily felt. This remarkable product had actually penetrated the pores of the metal even though the metal surface remained dry to the touch. If I hadn't seen it with my own two eyes, I would not have believed it! If I had initially believed in the abilities of the Weapon CLP I would have photographed the sequence of events.

With a new-found belief in Weapon CLP's lubricating properties, I turned my attention to an ongoing problem I was having with one of my 10/22s. After digesting thousands of rounds, my 10/22 was having failure to eject and jamming problems. I initially thought that it just needed to be cleaned and lubricated. After cleaning and lubricating it with my favorite, and what I considered to be the best lube on the market, I fired a few rounds before it acted up again. The same problems that plagued me before cleaning were surfacing again. I was afraid that this 10/22 would be relegated to collecting dust at the back of my gun safe. I then proceeded to spraying the inside of the receiver and bolt with Weapon CLP. I worked the bolt back and forth for about 15 seconds. I then proceeded to load a 25-round Tactical Innovations aluminum magazine. I pulled the trigger

as fast as I could and all 25 rounds fired without a glitch! I no longer needed to be convinced that Weapon CLP was the real deal and proceeded to use it on both AR-15s and the Savage Model 110 FCP H-S Precision used in this test.

CENTERFIRE RIFLES TESTED

223 REMINGTON DPMS AR-15

In this test, I used two AR-15s chambered in 223 Remington. The first AR was custom built by DPMS. I started with a 16" stainless steel bull barrel fitted with a Picatinny rail gas block and a DPMS four rail free-floating handguard. Of course, DPMS upper and lower receivers were used in the construction. In addition, a DPMS six-position collapsible buttstock was added. I have been an avid fan of Timney triggers and thought that the new Timney AR 3 lb. skeletonized trigger would be perfect for this buildup. This modular trigger truly is a simple drop-in trigger. Using your rifle's original hammer/trigger pins, the Timney trigger is easily installed in under 30 minutes, even if you are a novice. With the Lyman digital trigger pull gauge I measured the trigger pull (average of 10 pulls) at 2 pounds, 15.1 ounces. The trigger pull was among the most consistent that I have tested. The trigger weight did not vary more than 1.5 ounces and the trigger pull was smooth and crisp with no creep.

When a scope is mounted on an AR, it is very difficult to pull back the charging handle. To solve this problem, I added a Badger Ordnance tactical latch. Its large, oversized handle makes it easy to operate the charging handle, even if you are wearing gloves. To further ease the operation of the AR, the small standard magazine release was replaced with Brownells oversize magazine release. I also find that the standard issue safety selector is too small for my liking and I replaced it with a DPMS oversize safety selector. After enhancing all necessary functions of the AR, I would be remiss in not using the best magazines available, Magpul PMAG. This lightweight magazine is constructed of an impact resistant polymer and is corrosion-resistant and self-lubricating. Each magazine comes with an impact cover which keeps dirt from entering the magazine and protects the lips from deformation if it is dropped. When it is time to use the magazine, you simply pop off the cover and place it on the

bottom of the magazine for safe storage. The magazine is easily disassembled and has a flared floorplate to make magazine extraction easier. The thirty-round magazines feature a window on both sides of the magazine so that it is easy to keep track of how many rounds are left. For testing off the bench, I used the shorter twenty-round magazines.

I mounted the new and innovative Weaver Tactical Rifle 4-20x50mm scope with Burris 30mm Xtreme Tactical Rings. These lightweight aluminum six-screw rings are equally at home on a Picatinny rail or a Weaver-style base and can stand up to any abuse you dish out. This 5x scope has a 30mm tube with side focus parallax adjustment and a first focal plane mil-dot reticle. A first focal plane reticle differs from a second focal plane reticle in that the reticle appears to grow larger and thicker as the power is increased. This is especially useful in the mil-dot reticle which seems to be growing in popularity. This feature is very important to tactical shooters as well as law enforcement/military shooters because a second focal plane mil-dot reticle is useful only at one magnification (specified by the manufacturer). Although I don't use the mil-dot reticle for estimating range, I find it extremely useful for long-range shooting.

In addition, the fully multicoated lenses have an extra hard coating on the exterior lens surfaces and this dramatically helps reduce the chance of scratching the lenses. As to be expected, the one-piece constructed scope is waterproof, shockproof, and fogproof. To prevent internal fogging, argon has been used to purge the scope tube. I am especially fond of the ¼ MOA cap-less, pull-up, resettable turrets. To adjust windage and elevation, simply pull up on the



cap until you hear an audible click and then rotate the dial until the desirable location has been reached. After you are finished, you simply push the cap back down until an audible click is heard. If you want to reset the dials to zero, simply unscrew the large knurled dial indicator screws (located at the top of the turrets), slide the dial indicators off the turrets, orient the dial indicators to the zero position, and then retighten the dial indicator screws. The optical qualities of this scope were very good and comparable to other high end scopes. I was so impressed with the scope that I told Weaver to send me a bill because I was keeping it!

223 REMINGTON GG&G

DOMINATOR-1 AR-15

GG&G is world renowned for their reliable and dependable quick detach optical mounting systems and tactical weapon accessories. Like most AR aficionados, I have numerous ARs that I have equipped with a wide range of optics. I have heavy, long-range high-power scopes, small compact scopes, and a myriad of red dot type scopes. Like most people, I can't afford to equip each AR the way that I would like to and therefore must share my optics. Because of this fact, I need quick detachable mounts that will hold their zero. GG&G mounts are guaranteed to hold zero within ½ MOA and I can at-

test to this, based on my vast experience with a wide array of their mounts. I can quickly remove one optic and replace it with another within a minute. Fast, easy, and accurate best describes GG&G Accucam Quick Detach Mounts.

Based on my experiences with GG&G, I was more than delighted when I was given the opportunity to include the GG&G Dominator-1 5.56mm upper receiver in this test. This mil-spec forged 7075 upper receiver came with a 16-inch chrome-moly M203 contoured barrel with a 1:7" twist and threaded for a flash hider (or suppressor, in our case). The barrel and chamber are both hard chrome-lined for the ultimate in increased barrel life.

This upper came equipped with an A2 backup iron sight with a locking detent and a flip-up front sight that also was equipped with a locking detent. If you are using optics, you can simply flip these sights down out of the way and not have to worry about them. These sights work great if you are hunting in heavy brush and need to get on your quarry in a hurry. A carbine length four-rail free-floating handguard is T-marked, meaning it is sequentially numbered. The Picatinny rail on the upper receiver also is T-marked. This makes it easy to remember where to place your optics when you switch them around. To further make this upper user friendly, I added a Badger Ordnance charging handle latch and a Falcon SureGrip Ergo pistol grip.

Although this upper also was tested with the Weaver Tactical Scope for an accurate comparison, I usually mount the new Weaver red/green dot sight for use in the field. This

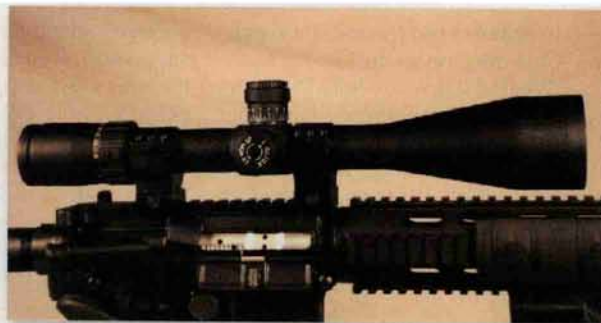
when tested with my Lyman digital trigger pull gauge. The Savage came equipped with a heavy 24" barrel with a 1:10" twist. I was going to use this barrel until I had a conversation with Whit Engel. Whit owns Engel Ballistic Research and is the foremost authority on subsonic ammo. Whit knew that my ultimate goal for the 308 was firing subsonic rounds. Whit said that his research has shown that a 20" heavy barrel with a 1:10" twist was perfect for firing both supersonic and subsonic ammo, but if I wanted to fire subsonic solely, a 1:8" twist was preferred. A faster twist gives added stability and allows the use of less than optimal bullets. I decided to have Bartlein Barrels rebarrel the Savage with a 1:8" twist, but I should have waited until after I conducted my supersonic tests. I will explain later. Bartlein barrels supplied one of their excellent 5R 1:8" twist stainless steel barrels chambered in 308 Winchester Obermeyer (not sure what the difference is). This heavy barrel contour tapered to 0.875" at the muzzle. Bartlein set it up like a Remington barrel and did away with the Savage barrel nut. Because of the heavier barrel, Bartlein had to open up the stock's barrel channel. They completed the work by threading the barrel 5/8"x24 Class 3A so that a suppressor could be used.

To secure the scope to the receiver, I used Farrell Industries FG-Force scope mount. This precision CNC-machined base also has an angled screw which wedges against the receiver opening, acting as a recoil lug to divert recoil away from the base and mounting screws. Another unique feature found only on Farrell's mounts is a bedding groove on the

red/green dot sight has a 30mm tube and with five red and five green brightness settings it can be used in any level of light. In addition, it has four different reticles: a micro dot (3 MOA), dot (6 MOA), 25 MOA circle, and a 25 MOA circle with a 3 MOA dot. This sight is the perfect match for this small, lightweight, fast-swinging upper. With this setup it is easy to get on target when a varmint is fast approaching. This sight has served me equally well when hunting varmints at night. This rig becomes the ultimate night-time hunting tool when I mount the Command Arms FGA Vertical Grip and 1" light mount. To illuminate varmints with blinding light, I used the Sightmark Q5 Triple Duty flashlight with an output of 280 lumens. A light this intense is capable of holding the attention of any prey long enough to get off a shot.

SAVAGE IN 308 WINCHESTER

When I decided to include the 308 Winchester in this article, a Savage bolt-action was my logical choice. The most accurate out-of-the-box firearms that I possess are manufactured by Savage. After perusing the Savage catalog, my focus was drawn to their law enforcement offerings. I decided on the Model 10 FCP H-S Precision. This rifle had an H-S Precision fiberglass stock and was equipped with two front sling swivel studs (the second one for a bipod). It also had a detachable four-round magazine that I prefer. I always seem to have more positive feeding with fewer problems than those rifles equipped with a hinged floorplate. Of course, no Savage would be complete without an AccuTrigger. The AccuTrigger on my 308 measured 2 lbs, 10.1 oz (average of 10 pulls)



Weaver Tactical Rifle with 4-20x50mm scope.

underside of the mount. By applying a bed of epoxy in this groove, you can assure complete flatness and a perfect base-to-receiver fit.

Since my long-term goal was to use the Savage specifically for subsonic loads, I wanted a mil-dot reticle to make it easier to compensate for its rainbow trajectory. My friend Alan Orr at Sightron was telling me about their new SIII model that would be perfect for my testing. Within a week the new 6-24x50mm Long Range Rifle Scope was in my hands. These scopes are made in Japan and have 30mm tubes and feature side focus parallax adjustments. Although I wish it was a first focal plane scope, the optics were impressive and compared favorably with the Leupold Mark 4 scopes. Its tall target turrets feature 1/4 MOA clicks that are easy to hear and

feel. In order to use the mil-dot reticle, the scope must be set on 24x.

Weaver's new six-hole Picatinny Tactical 30mm rings were used to mount the Sightron scope. These aircraft-grade aluminum rings feature an improved Picatinny crossbolt design, resulting in maximum security and clamping pressure. These very affordable rings feature no strip/slip Torx screws and also are available in 1" and varying heights to meet all your needs.

SUPPRESSORS TESTED, 223

As you may remember from the Part II article on rimfire suppressors, the Gemtech G5 suppressor was used on the 22 Winchester Magnum. The G5 is Gemtech's best fully auto-rated 223 suppressor and was used on our 223 Remington AR-15s. The G5 utilizes a quick-mount flash hider that is simply screwed onto the barrel's ½"x28 Class 2A threads. The G5 is quickly pushed down onto the flash hider and with a quick twist it is secured in place. The G5 suppressor is 7" long, 1.5" diameter, and weighs 21.0 oz. The black oxide-finished suppressor is composed of Inconel, stainless steel, and titanium. If

you are looking for an even lighter 223 suppressor, Gemtech recently released the new G5-T suppressor that is composed entirely of titanium (except for an Inconel blast baffle).

SureFire, a maker of some of the best, brightest, and most durable flashlights, also manufactures suppressors. SureFire dominated the flashlight industry by utilizing the latest technological advancements under the direction of some of the best minds in the industry. SureFire used this same philosophy when they started building suppressors. High temperature exotic alloys were employed in the making of their suppressors, as well as new cutting edge designs. I tested the SureFire FA 556K suppressor, which measures 6" long and 1.5" diameter and weighs 16 oz. Standard ½"x28 Class 2A threads were used. All SureFire suppressors are Fast Attach (FA) meaning they use various thread-on adapters (muzzle brakes, flash hidens, and compensators) so that suppressors can be attached and detached with a quick twist. I attached their muzzle brake (MB556K) to the suppressor.

The third and final 223 suppressor that I tested was the Karma 5 built by Tactical Solutions. This company is well-known for their superlative aftermarket 10/22 components, but relatively new in the suppressor industry. The Karma 5 is 6.5" long, 1.5" diameter, and weighs 18.0 oz. The outer body is machined from stainless steel. It has a durable Inconel blast baffle and is rated for full-auto. Of course, it has standard ½"x28 Class 2A threads.

308

The Gemtech Sandstorm is the lightest and shortest 308 suppressor on the market. It measures only 7.8" long and 1.5" diameter. Its all-titanium construction is responsible for its extremely light weight of only 13.3 ounces. Theoretically, this lighter weight should translate into reduced point of impact shift. This should result in less disruption of barrel harmonics. Titanium is significantly lighter and stronger than steel and should also cool off faster than steel.

The next 308 suppressor tested was John's Guns R18 QD (Quick-Detach) suppressor. This massively built

suppressor is 8.5" long, 1.5" diameter, and weighs an amazing 32.5 oz. This weight does not include the weight of the muzzle brake to which it is attached. The R18 QD is attached by pushing down and twisting, and has standard $\frac{5}{8}$ "x24 Class 3A threads. This suppressor is almost 2.5 times larger than the Gemtech Sandstorm suppressor. If the aforementioned theory is correct, the R18 suppressor should dramatically shift the point of impact. This heavyweight suppressor produced both positive and negative results.

The third and last suppressor tested was the Karma 7 by Tactical Solutions. This is basically just a larger version of the Karma 5 suppressor. The Karma 7 is 8.5" long, 1.5" diameter, and weighs 23.0 oz. It has a stainless steel body and an Inconel blast baffle. The Karma 5 and Karma 7 are both built as a monocoire design.

SCOPE MOUNTING AND RETICLE LEVELING

Mounting a scope on an AR always has been a pain simply because most gun vises are not tall enough to keep the pistol grip from hitting the bottom of the vise. The same problem also exists when you are trying to clean an AR. While searching the Web, I came upon CTK Precision that made what looked to be the perfect gun vise. I immediately e-mailed Curt Knitt, the owner of CTK Precision, and explained to him what I was looking for. Curt immediately replied to my e-mail and said that a P3 gun vise as well as the P3 shooting rest, All Purpose gun level, and a Universal Brass Catcher were already packed and waiting to be picked up by UPS. Talk about service! I have dealt with many companies, but nobody has been as helpful and responsive as Curt at CTK Precision. CTK Precision products are all made in the United States.

Within three days the package was delivered and I was extremely eager to see what awaited me. The first thing that struck me when I opened the package was how well every component was packed — every single piece was wrapped in bubble wrap. No way were the shippers going to damage any CTK product. I don't know how many times I have opened packages and been disappointed with what I saw because careless packing had left the components scratched, bent, or damaged.

The P3 gun vise also doubles as a shooting rest when the rear gun vise is replaced with the P3 shooting rest. The gun vise instructions were simple and straightforward, and assembly was completed in short order. I was amazed at the quality of components used in this vise. No cheap, flimsy components were used in these products. The T-shaped vise was constructed of e-coated (outside and inside) 1.25" square tubular steel. Its 18" width and 25" length made this vise very stable and able to handle any rifle, and even pistols. Each end of the T was equipped with a rubber-protected leg that can be adjusted by turning a large black knob. At the junction of the T, I added a two-way level that enabled me to be sure the vise was completely level. This would come in handy when making sure that the scope's reticle was perfectly level.

I placed the DPMS AR in the gun vise and was amazed with how strong the vise gripped the buttstock and how high the rifle was held. No chance of the pistol grip ever coming close to the bottom of the vise. I now had a vise that would easily let me mount scopes on any rifle, clean any rifle, bore sight, perform routine maintenance, and test trigger pull weights. After mounting the scope on the rings and securing it to the AR's Picatinny rail I was ready to level the scope's reticle with the CTK Precision All Purpose Gun Level. This easy-to-read 4" red anodized aluminum level has an elastic strap that can easily reach around the largest firearm. Although I had already leveled the legs with my two-way level, I used the gun level to ensure that the gun was also level. I placed the gun level on top of the Picatinny rail and secured it in place by wrapping the elastic cord around

the trigger guard and securing it back to the slot in the gun level. I needed to tweak the rifle only slightly in order to perfectly line up the bubble between the two hash marks. To perfectly line up the scope's crosshairs, I placed a plumb bob (basically a string with a weight attached at the end) at the top of a doorway. I looked through the scope and rotated the scope until its vertical crosshair was aligned with the vertical reference line created by the plumb bob. This process was amazingly simple and extremely accurate.

The next CTK Precision product, the Universal Brass Catcher, solved my problem of chasing down brass. With this project, I was going to be firing in excess of 1,200 rounds of 223 and 308 brass and I didn't look forward to trying to find that much brass! CTK's solution to this age-old problem is so simple and ingenious I can't believe no one had thought of this before. Basically, it is a fish net on a stand. This high quality mono-rail net (similar to, if not a minnow net) stands 19" tall and has an opening of 16"x16" with a 12"x12" frame. The front of the frame is composed of 1"x2" e-coated tubular steel which also serves as a ballast tank. It has end caps that allow you to fill the interior with shot or sand if you are experiencing a problem with the net not staying upright (high winds, etc.). You can place the brass catcher on your bench or it can be attached to a camera tripod (it has $\frac{1}{4}$ "-20 threads on the bottom of the frame). This product has saved me many "grunt hours" searching for brass.

BENCH REST TESTING

The bench rest testing for the 223 Remington and 308 Winchester were conducted at 100 yards. The extremely stable and roomy Caldwell BR Pivot



Savage Model 10 FCP H-S Precision Rifle with Bartlein barrel.

synthetic-topped bench was used again. Testing an AR on the bench offers a couple of challenges. The round handguard has a tendency to roll on the front rest, making accurate shot placement more difficult. The greatest challenge lies in the shape of the AR buttstock. This is especially true with the increasing popular collapsible buttstocks. The sloping narrow shape of this buttstock makes it exceedingly difficult to use with a rear bag. I have tried it and walked away frustrated, to say the least!

With the ever-increasing popularity of ARs, especially in competitive shooting, my friend George Smith, owner of EGW in conjunction with Robert Whitley, owner of ARX-Products, developed a bag rider bench rest system (no gunsmithing required) for ARs. This system consists of front and rear Delrin blocks. The three-inch wide front block attaches at the swivel stud mount by simply unscrewing the swivel stud, putting the front block in place, and screwing the supplied hex-head screw until tight. The inside of the front block is contoured to match the profile of a handguard so that any wobble is eliminated. The rear Delrin block replaced the rear sling loop. First, remove the screw at the bottom edge of the buttplate and slide the sling loop out. Next, place the tang of the rear block in the sling loop slot and replace the attachment screw. Now, the AR is stable and it tracks true and straight back, as it should.



GG&G Dominator-1 223 Remington AR-15.

Now I needed an affordable bench rest quality front rest, and the Caldwell Rock BR was absolutely perfect for this task. This heavy 13 lb. rest has a 14" footprint, a base made of cast iron, stainless steel leveling feet, ball bearing cradle, adjustable fore-end stop, and a bag tensioning adjustment. In addition, it has both coarse and fine elevation adjustments as well as a fingertip windage adjustment. The Rock BR front rest has plenty of elevation adjustment, needed when firing an AR. Because of the elevated position needed for the AR, a Caldwell Universal Deluxe Shoulder Saver Magnum Rear Bag was used. This rear bag is considerably taller than the average rear bag and worked perfectly with the Rock BR front rest. The AR was high enough that the pistol grip did not bottom out on the bench, but it was still comfortable to shoot.

With the bolt-action 308 Winchester Savage, I went back to using the Caldwell Fire Control Full Length Rest. This is a coaxial (joy stick) design that enables you to adjust both windage and elevation with one control arm. Now you can make adjustments to exactly line up your crosshairs on the target without ever taking your eyes off the target. I definitely noticed an improvement in my shooting skills and I was able to get back on target quicker after firing.

The Oehler Model 35 chronograph was used to record muzzle velocities. As far as I am concerned, this is the best chronograph ever made. Sadly, production ceased several years ago, but there is good news on the horizon. It appears that by the time you read this, new Model 35 chronographs will once again be available.

Another critical and often overlooked component in ballistic testing is weather data. It may be difficult to duplicate a particular load or result if you are not aware of the climatic conditions at the time of testing. To record important and necessary weather data, I have been using the Kestrel Model 4000 hand-held weather station. This instrument is simple to use and provides you with more data than you will need.

In order to achieve statistically significant results, a large pool of data was needed for each centerfire test group. In the 223 and 308 tests, 10 five-shot groups were fired for each test group. After each test group was fired, the rifles were cleaned and lubricated with Weapon CLP. A fouler shot was fired before the testing began. Since all groups were fired under the same conditions, the data could be collectively grouped as one large 50-shot group. I could have shot all groups into one target, but most individual shots would not be discernable from each other. This would make it impossible to assign an X and Y value to each shot. Such values are necessary if the results are going to be statistically analyzed.

The control, or the unsuppressed, group was compared to three different 223 suppressors. Three different types of 223 Remington ammunition were tested. No "flyer" shots were eliminated from the data except when the procedure had been compromised. In a couple of instances, the suppressor was not adequately tightened on the barrel. This resulted in shots that went astray. These shots can be contributed to "altered procedure" and not the result of bad shooting. This problem happened only a couple of times when testing the 308 groups. It was necessary to eliminate these groups in order to remove any bias or skewing in the data.

Bullet hole groups were precisely measured using the On Target Precision Calculator software. This provided data

in the X and Y form so that the data could be statistically analyzed. Each bullet has an X (windage) and Y (elevation) coordinate that is based on its location relative to the aiming point. This information is then transferred to a spreadsheet program such as Microsoft Excel. By transferring the data into Excel, it is much easier to import these data into GAP (Group Analysis Program).

GAP enables a shooter to perform much more complete and sophisticated analysis that entails complicated mathematical computations. GAP incorporates statistics and sophisticated mathematics that tell research scientists whether their results are statistically significant. Unlike other target analysis programs, GAP tells you how accurate and repeatable your results are. Without this feature, your results are almost meaningless. In addition, GAP offers predictive statistics that will calculate expected future groupings as well as future shot placement probabilities. Of course, the more shot data that you supply, the more accurate your results will be. Two or three groups will provide you with limited useful data.

Muzzle velocity data is statistically analyzed using WINKS SDA software. WINKS SDA is a statistical analysis software program used for determining the accuracy of your results. After I chronograph my velocity data, I enter these results into WINKS SDA and this program will then determine if the velocity of each variable is significantly different from the others.

GROUP SIZE

In the second article about rimfire suppressors, we discussed this in great detail. In summary, extreme spread, also called CTC (Center to Center), is a very poor and inaccurate statistic for measuring group size. In general, a target group is elliptical in shape and not round as commonly perceived. Average Group Width is defined as the average distance of this ellipse from the center of the group. The Average Group Width statistic is routinely used in scientific data analysis because it is completely objective.

SAMPLE SPECIFIC vs. PREDICTIVE STATISTICS

Our results will be interpreted by the use of predictive statistics. Although the groups that we shot (10 five-shot groups) yielded statistically significant results, this information tells us only about the groups fired (sample specific statistics) and not what we can expect of future groups (predictive statistics) shot under the same conditions. Because of our large sample size (50) our sample specific results are very similar to the predictive statistics. The primary difference between the two is that the predictive statistics uncertainty levels are usually much larger than the uncertainty of sample specific statistics. A larger uncertainty level means that the difference between two groups must be greater if they are going to be statistically significant. This gives us further insurance that the results we obtained can be duplicated in the future with a high degree of certainty.

223 REMINGTON RESULTS

In the 223 Remington tests three suppressors, two AR-15s, and three different types of ammo were used. The DPMS AR-15 was used for testing the Hornady 55-gr. V-Max and the Federal American Eagle 62-gr. FMJ ammo. The GG&G Dominator-1 AR-15 upper (I used the same lower for both ARs) test-fired the Hornady 75-gr. BTHP ammo.

The statistical software program Winks SDA was used

to correctly interpret these complex data. Winks SDA used one-way analysis of variance (ANOVA) to test the hypothesis that the mean values of the various test groups in each type/brand of ammo were equal. If the ANOVA test was significant then a Newman-Keuls multiple comparison test was used for pair-wise comparisons. Winks SDA found that there were no statistical differences in muzzle velocity readings for both the American Eagle 62-gr. FMJ ammo and the Hornady 75-gr. BTHP ammo. When comparing muzzle velocities for the Hornady 55-gr. V-Max ammo, Winks SDA found that both the SureFire FA556K (2,961 fps) and the Tactical Solutions Karma 5 (2,958 fps) suppressors were significantly faster than the Unsuppressed (2,934 fps) group and the Gemtech G5 (2,946 fps) suppressor, but were not significantly different from each other.

The velocity results for all three brands of ammo used were compiled. In addition, the windage (\pm uncertainty level), elevation (\pm uncertainty level), and Average Group Width (\pm uncertainty level) of the predictive statistics were compiled. Each value for windage, elevation, and Average Group Width also includes a \pm uncertainty value. The uncertainty value is derived from the uncertainties in the hole locations and how they affect the calculation of the group center (mathematically derived). For example, the Average Group Width of the Unsuppressed Hornady 55-gr. V-Max group is $0.68" \pm 0.12"$. This means that the Average Group Width can vary from a low of $0.56"$ to a high of $0.80"$. For example, when comparing the Average Group Width (AGW) of two groups, such as the Unsuppressed Hornady 55-gr. V-Max to the Gemtech G5 Hornady 55-gr. V-Max, the smallest Average Group Width is subtracted from the largest Average Group Width ($0.90" - 0.68" = 0.22"$). This value ($0.22"$) is compared to the largest uncertainty value of the two groups, which is $0.15"$ (Gemtech G5). Since $0.22"$ is larger than $0.15"$, then the two Average Group Widths are statistically different from each other. The Unsuppressed group is significantly $0.22"$ smaller than the Gemtech G5 suppressor group.

Data compilation compares the predictive statistics for each ammo in a paired fashion, enabling each sup-

pressor group and the control group (Unsuppressed group) to be compared with each other in every possible configuration. In the Hornady 55-gr. V-Max ammo category, the Gemtech G5 suppressor group's POI (Point Of Impact) was almost 0.70" to the left and almost 0.40" higher than the Unsuppressed group. As the above example showed, the Unsuppressed group's Average Group Width was statistically 0.22" smaller than the G5 suppressor group. The SureFire FA556K group was more than 0.30" to the right and almost 1.00"

lower than the Unsuppressed group. The Unsuppressed group's Average Group Width was 0.15" smaller than the SureFire group. Tactical Solutions' Karma 5 suppressor group was 0.20" to the right and almost 0.90" higher than the Unsuppressed group. The Average Group Width of the Unsuppressed group was 0.13" smaller than the Karma 5 group. When comparing the G5 and SureFire group, the G5 group was almost 1.70" to the left and almost 1.40" higher than the SureFire group. There was no difference in Average

Group Width. When the G5 group was compared with the Karma 5 suppressor group, the G5 group was almost 1.60" to the left and almost 0.70" higher than the Karma 5 group. In our last comparison, the SureFire suppressor group was 0.10" to the right and almost 0.70" lower than the Karma 5 group. The SureFire group's Average Group Width was 0.18" smaller than the Karma 5 suppressor's Average Group Width.

The next ammo tested was Federal's American Eagle 62-gr. FMJ. When the Unsuppressed group was compared with the Gemtech G5 suppressor group, the G5's POI was almost 0.70" to the left and almost 0.70" lower than the Unsuppressed group. There was no difference in Average Group Width. The SureFire group was almost 0.30" to the right and almost 1.20" lower than the Unsuppressed group. Once again, there was no difference in AGW. The Karma 5 group's POI was 0.30" to the right and almost 0.40" lower than the Unsuppressed group. There was no difference in Average Group Width of the two groups. The G5 suppressor group was almost 0.90" to the left and almost 0.60" higher than the SureFire suppressor group. There was no difference in AGW of the two. When compared with the Karma 5 group, the G5 group's POI was 0.90" left and almost 0.50" lower. No difference was observed in Average Group Width. There was no difference in the windage of the SureFire group and the Karma 5 group, but the SureFire group was 0.80" lower. Again, there was no difference in AGW.

The Hornady 75-gr. BTHP ammo was fired with the GG&G Dominator-1 upper receiver. When compared with the Unsuppressed group, the POI of the G5 suppressor group was over 2.0" to the left and almost 0.30" higher and there was no difference in Average Group Width. The SureFire suppressor group was 0.60" to the right and almost 0.90" lower than the Unsuppressed group. The AGW of the Unsuppressed group was 0.11" smaller than the SureFire group. The Karma 5 group was almost 0.60" to the right, but there was no difference in the elevation of the Unsuppressed and Karma 5 group. The AGW of the Karma 5 suppressor group was 0.10" smaller than the Unsuppressed group. The Gemtech G5 suppressor group's POI was almost 3.30" to the left

and 1.10" higher than the SureFire suppressor group. There was no difference in AGW. When comparing the Karma 5 and G5 groups, the G5 group was 2.70" to the left and almost 0.30" lower, but the Karma 5 group's Average Group Width was 0.17" smaller than the G5 group. There was no difference in the windage of the SureFire group and the Karma 5 group, but the Karma 5 group was more than 0.80" higher. The AGW of the SureFire group was 0.22" smaller than the Karma 5 suppressor group.

308 WINCHESTER RESULTS

The 308 Winchester test consisted of three suppressors and three different brands of ammo used on a Bartlein-barreled Savage Model 10 FCP H-S Precision. The Gemtech Sandstorm, John's Guns R18, and the Tactical Solutions Karma 7 suppressors were used in this test. The ammo tested was Federal's American Eagle 150-gr. FMJ, Nosler 165-gr. Partition, and Winchester 180-gr. PowerPoint. The results with the aforementioned 308 Winchester ammo demonstrated that I should have waited until after the test to rebarrel. The original Savage barrel had a 1:10" twist and was replaced with a new Bartlein barrel with a 1:8" twist. Bartlein barrels are among the finest in the country and I think that the faster twist 1:8" barrel was over-spinning the bullets and therefore reduced the accuracy of the ammo. I knew that the American Eagle ammo was strictly for practice, but the Nosler 165-gr. Partition and the Winchester 180-gr. PowerPoint are capable of very good accuracy. There was absolutely no consistency in the shot groups, although the Nosler 165-grain Partition ammo had significantly smaller Average Group Widths than the other two brands of ammo. I thought that the heavier Winchester ammo would have shot tighter groups than it did in the 1:8" twist barrel. Only after firing subsonic ammunition can I determine if the twist or barrel was at fault. Nevertheless, a mistake was made.

Once again, the muzzle velocity data was analyzed using Winks SDA software. Firing the American Eagle 150-gr. FMJ ammo revealed that the John's Guns group was statistically the fastest group (2,825 fps). The Tactical Solutions Karma 7 (2,815 fps) and Gemtech Sandstorm (2,814 fps) suppressor groups were statistically faster than the Unsup-

pressed group (2,806 fps), but were not significantly different from each other. When the Nosler 165-gr. Partition loads were tested, John's Guns (2,630 fps) was statistically the fastest group again. John's Guns was 56 fps faster than the Unsuppressed group. Once again, both Karma 7 (2,595 fps) and Sandstorm (2,600 fps) groups were statistically faster than the Unsuppressed group (2,574 fps), but not significantly different from each other. Firing the Winchester 180-gr. PowerPoint ammo garnered different results from the other two brands of ammo. The Sandstorm (2,606 fps) and Karma 7 (2,601 fps) groups were statistically faster than the other groups, but not significantly different from each other. This time John's Guns (2,595 fps) was not significantly different from the Unsuppressed group (2,592 fps).

All the windage, elevation, and Average Group Width predictive statistical values as well as their uncertainty amounts were compiled. Starting with the American Eagle 150-gr. FMJ ammunition, the Sandstorm group was more than 0.40" to the right and 1.00" higher than the Unsuppressed group. There was no difference in Average Group Width. John's Guns was almost 5.40" to the left and 4.10" lower than the Unsuppressed group. There was no difference in AGW. When Karma 7 was compared with the Unsuppressed group there was no difference in windage, but Karma 7 was almost 0.90-inch lower. The Unsup-

pressed group's AGW was 0.59" smaller than the Karma 7 group. John's Guns was almost 5.80" left and 3.10" lower than the Sandstorm group. The AGW of the Sandstorm group was 1.33" smaller than John's Guns. The Sandstorm group was more than 0.40" right of the Karma 7 group, but the elevation of both groups was not different. The Sandstorm group's AGW was 0.66" smaller. Once again, John's Guns was almost 5.40" left and 3.25" lower than the Karma 7 group. The AGW of Karma 7 was 0.67" smaller than John's Guns.

When testing the Nosler 165-gr. Partition ammunition, the Sandstorm group was almost 0.70" right and 0.60" lower than the Unsuppressed group. There was no difference in Average Group Width. John's Guns was almost 3.80" left and 2.70" lower than the Unsuppressed group. The Unsuppressed group's AGW was 0.91" smaller than John's Guns. There was no difference in windage for the Unsuppressed group and Karma 7, but Karma 7 was almost 1.10" lower. The AGW of the Unsuppressed group was 0.77" smaller. John's Guns was 4.40" to the left and 3.30" lower than the Sandstorm group. The Sandstorm group's AGW was 1.11" smaller than John's Guns. When compared with Karma 7, the Sandstorm group was 0.50" right and almost 1.60" higher. The Sandstorm group also had an AGW that was 0.97" smaller than Karma 7. John's Guns POI was 5.40" left

and 2.80" lower than Karma 7. There was no difference in AGW.

The final ammo tested was Winchester 180-gr. PowerPoint. There was no difference in windage for the Unsuppressed and Sandstorm groups. The Unsuppressed group was 0.70" higher while the AGW of the Sandstorm group was 1.67" smaller. The POI of the John's Guns group was 5.40" to the left and 3.80" lower than the Unsuppressed group. There was no difference in the Average Group Width. When the Karma 7 group was compared to the Unsuppressed group, the Unsuppressed was almost 0.90" right and almost 0.40" higher. The AGW of the Karma 7 group was 0.66" smaller than the Unsuppressed group. When the POI of John's Guns was compared to Sandstorm, John's Guns was 5.40" left and 3.00" lower. The Sandstorm group's AGW was 1.59" smaller. The windage of Karma 7 was almost 0.90" to the left and 0.40" higher than Sandstorm. The AGW of Sandstorm was 1.01" smaller. Last but not least, John's Guns was almost 4.50" left and 3.40" lower than the Karma 7 group. There was no difference in the Average Group Width.

CONCLUSION

Although there was no statistical difference in muzzle velocities when the American Eagle 62-gr. FMJ and Hornady 75-gr. BTHP 223 Remington ammo were fired, a general trend was observed. When all the data from all three brands of 223 Remington were combined, the muzzle velocities of all three suppressors were greater than the Unsuppressed group. Tactical Solution's Karma 5 (2,817 fps) recorded the fastest velocity followed by the Gemtech G5 (2,814 fps) suppressor, the SureFire FA 556K (2,808 fps) suppressor, and then the Unsuppressed (2,804 fps) group. This seems to support the contention that suppressors increase muzzle velocity. When the Average Group Width of all three brands of 223 Remington ammo were combined, all of the test groups varied by only 0.06".

In Part II we found that rimfire suppressors did not have a great influence on Point Of Impact, but the same cannot be said of centerfire suppressors. In general, the POI of 223 suppressors was lower and to the right of the Unsuppressed group. The Gemtech G5 suppressor consistently shot to the left and

usually high. The Surefire FA 556K POI was to the right and lower. Tactical Solutions Karma 5 suppressor consistently shot to the right, but wasn't consistent in elevation POI. When comparing the 308 suppressors, the POI on average, was also lower than the Unsuppressed group, but there was no consensus on windage. The Gemtech Sandstorm's POI was consistently to the right and generally high. As previously noted, John's Guns POI was extremely and very consistently to the left and consistently much lower. Tactical Solutions Karma 7 shot primarily left and lower.

The John's Guns R18 suppressor recorded the fastest muzzle velocities when using the American Eagle 150-gr. FMJ and Nosler 165-gr. Partition ammo. The average increase in velocity was 33 fps. As I mentioned previously, this was one of the positive attributes of this suppressor. On the negative side, I surmised that the extreme weight of the John's Guns suppressor (almost 2.5 times heavier than the Gemtech Sandstorm) caused an extreme shift in Point of Impact. This is most likely because of a dramatic change in barrel harmonics. For all three brands of ammo, John's Guns R18 suppressor had an average shift in windage of 4.6" left and 3.1" lower in elevation. Unfortunately, this suppressor also seemed to have a negative influence on Average Group Width as well. When combining data from all three brands of ammo, John's Guns R18 suppressor had the largest AGW (2.82"). The lightest suppressor, the Gemtech Sandstorm, had the smallest AGW (1.47"). Tactical Solutions middle-in-weight Karma 5 suppressor had an AGW of 2.35" while the un-suppressed control had an AGW of 2.12". Of course, if weight were the only consideration, the rifle without a suppressor would always shoot best! Internal suppressor design and other factors, such as barrel length, barrel stiffness, etc., all play a dynamic role in altering barrel harmonics (both positive and negative benefits).

Although not statistically significant, it was interesting to note the muzzle velocities, when all three brands of 308 Winchester ammo were combined, were faster than the Unsuppressed test group. As was expected, John's Guns R18 (2,683 fps) suppressor was the fastest, followed by Gemtech Sandstorm (2,673 fps), Tactical Solutions Karma 7

(2,670 fps), and then the Unsuppressed (2,657 fps) group. These data would also seem to support the statement that suppressors, in general, increase muzzle velocity. Another important attribute of suppressors, especially in heavy recoiling rifles, is that a suppressor can reduce recoil by about 50 percent. The propellant gases that are generated as the bullet exits the barrel account for about half of the rifle's recoil. A suppressor will capture and slowly release the gas, thereby reducing recoil. The added weight of the suppressor on the end of the barrel will limit muzzle rise and increase the controllability of the rifle. The most important benefit of a suppressor is the reduction of noise by 20 to 30 or more dB. A 30dB decrease in noise represents a 1,000 percent decrease in sound. Reducing the noise level of a 223 Remington round by 30 dB roughly equates it to a handclap.

This series of articles on suppressors has been an extremely enlightening learning experience. Delving into the secretive world of suppressors has allowed me to expand my knowledge and further pique my interest in sup-

pressors. First, I learned that I do have a legal right to own one. Unfortunately, not everyone in every state has this opportunity. Although my beloved state of Texas is not as liberal as some states when it comes to hunting with suppressors, varmints are fair game. Second, although not the "Silent Death" that Hollywood portrays, suppressed rifles are far less disturbing to your neighbors and the quarry that you are stalking. A missed varmint is just as likely to run toward you as it is away! Another word of advice: Keep calling at the same location since the reduced telltale sonic blast will surely not disturb nearby animals as much. The third and most important reason for shooting suppressed is that suppressors can and will save your remaining hearing. I don't know any hunter who has not been afflicted by the ravages of multiple supersonic muzzle blasts permeating their sensitive auditory canals. Let's not forget about what makes life worth living: an enjoyable hunting experience that's fun is further increased when a suppressed rifle comes into your life.



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