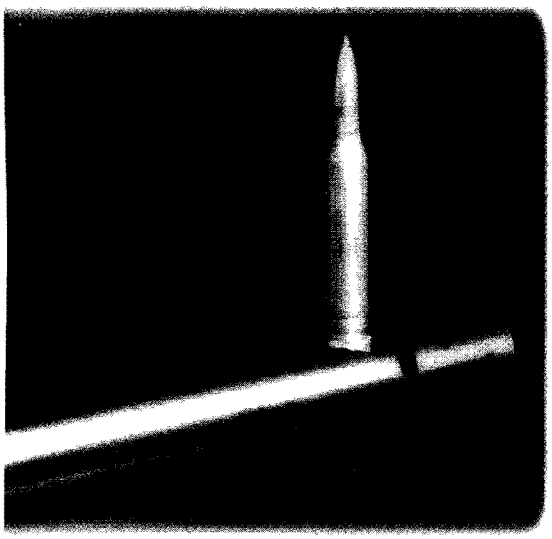
The Oakland Custom Arms Muzzle Brake

By Norman E. Johnson



The Oakland Custom Arms muzzle brake fitted to a .25-06 varmint weight barrel shows a most perfect installation job.

The subject material available to today's interested gun writers appears endless. We have the opportunity to examine everything from the gun muzzle to the butt plate; in fact, this treatise delves into both ends of the gun.

Recently I had the occasion to work with an Oakland Custom Arms muzzle brake. The timing was right on target because I was in the midst of working with a special dynamometer (recoil measuring device), which I designed, as well as a sound level meter made by Radio Shack.

Over a two-year period I had gathered a fairly broad sampling of firearms recoil statistics while using the dynamometer. Then John Anderson, executive editor of The VARMINT HUNTER Magazine, thought perhaps the use of a sound level meter could prove beneficial in conjunction with testing the muzzle brake. It is a known fact that reduction of recoil, via such recoil reducing devices, increases the sound level of the muzzle blast to the shooter ... a consideration which must not be overlooked when shooting.

For a varmint hunter the muzzle brake or compensator usually is installed on a fairly low recoil rifle to help reduce muzzle rise and thereby assist in keeping the scope on target as the bullet strikes the target. This, of course, offers a great aid in repeat shots where estimates in projected bullet impact may be off. It also provides immediate verification to the shooter where hits actually are made. Controlling the muzzle action in this way is accomplished with a compensator that is somewhat different from a true muzzle brake. The compensator usually is applied to calibers ranging from .224 to the .243 where the controlling of upward muzzle movement is made possible. This is accomplished by diverting propellant gases upward or sideways, counteracting the upward muzzle climb. By comparison, a true muzzle brake is designed to cut back on perceived recoil by directing muzzle gases in a way that it actually pulls forward on the gun. This counteracts some of the recoil forces, making it more pleasant for the shooter. However, while reducing some of the recoil, the muzzle brake — while diverting propellant gases in all directions — does not prevent muzzle rise. The Oakland Arms muzzle brake operates by placing a vertical surface forward of the muzzle with just enough clearance for the bullet to pass undisturbed and a large portion of the spent gas is sprayed upon it. Thus, the gas is still under very high pressure, and creates a large force opposite to the recoil force. The location of the vertical wall, the volume of gas available, and the velocity of the gas play a major role in actual reduction achieved ... the harder the gun kicks, the more efficient their brake works. By its unique design, this muzzle brake is covered by a U.S. Patent. With this in mind, I chose to have a standard type muzzle brake installed on one of my varmint-weight caliber .25-06 barrels.

My experience with the .25 caliber bore goes back to 1959 ... long before the availability of such fine .25 caliber bullets as we have today. I became fond of the quarter-bore, which was somewhat of a stepchild during that time. It began with the .257 Roberts cartridge and eventually included the .257 Weatherby, various improved .257 calibers and, of course, the .25-06. In my long-range winter canine predator hunting, the .25 caliber lacked little; and as better bullets came on the scene, this caliber began to take back seat to few.

As I sent my barrel in to Oakland Custom Arms I was keenly aware of the accuracy of this rifle as well as the documented recoil while using one of its finest varmint loads. While the rifle handled several fine bullets, including the Sierra 87-grain PSP, the Speer 87-grain PSP, and the Nosler 85-grain Ballistic Tip, it proved extremely capable with the 75-grain Hornady V-Max bullet along with 48 grains of XMR 4064 powder.

The rifle I chose to have the muzzle brake installed on was a Thompson/Center TCR '83 single-shot with a 24-inch Remington varmint-weight barrel. The rifle is a switch-barrel type that I designed by machining a TCR '83 monoblock to accept barrels turned down and fitted at the breech end. The system performs very well and I have nine fitted barrels thus far for the rifle.

Recoil energy produced by this 9½ pound rifle, using the 75-grain Hornady bullet at near maximum velocity, certainly wasn't heavy at around 8 foot pounds. However, there was sufficient kick to seriously disturb scope alignment from shot to shot. Accuracy ranged from 0.50 moa to 0.70 moa prior to installation of the muzzle brake. There was some concern on my part whether the muzzle brake would change accuracy in any way along with reduction in felt recoil and measurable recoil in foot pounds on the dynomometer.

On the first day of testing with the newly installed muzzle brake I was pleasantly surprised at the reduction in recorded recoil, which was reduced by a full 55 percent. By comparison, recoil energy in foot pounds was now comparable to the smaller .22-250 with a 55-grain bullet.

For those who may be interested in some of the recoil comparisons among guns and loads, I've included a

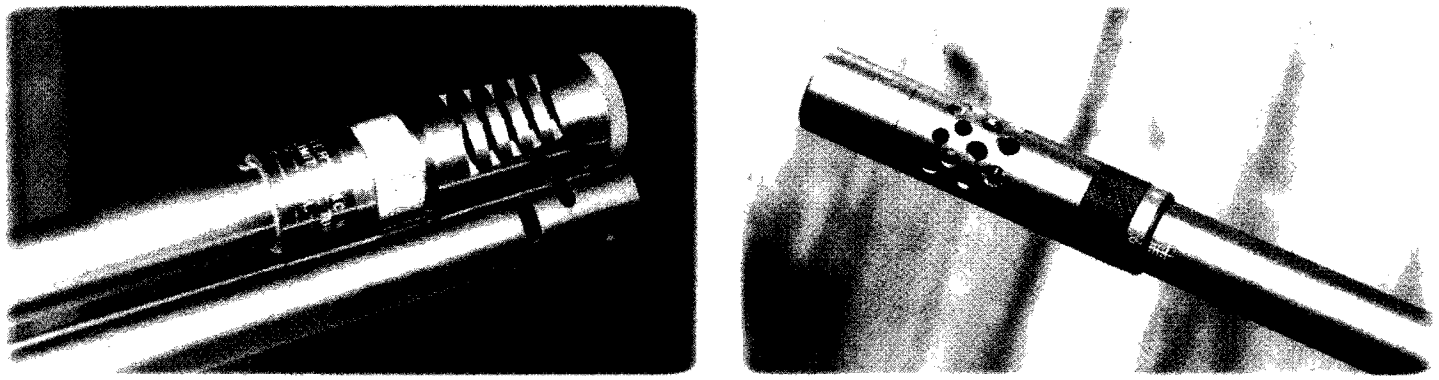
table of a few of the firearms I have tested. This also will serve to show the amount of reduced recoil a muzzle brake accomplishes in reduction of both actual and felt recoil.

For some time I wanted to discover a method to test and compare the recoil of the various firearms I work with. As the owner of a firearms testing range, among the guns sighted-in here are some heavy kickers. As we take a little closer look at recoil we learn that it begins as the bullet is pushed from the case mouth — albeit a very small amount at this time. Finally, maximum recoil is reached following bullet departure from the muzzle. Overly simplified, gun recoil is the product of opposing forces. Under great gas pressure a bullet is forced in one direction and the gun in the opposite direction. If the bullet and gun weighed the same, each would move away from the other at essentially the same velocity. However, the gun weighs a great deal more than the bullet. But even the relatively light weight of a bullet moving at high velocity has a significant rearward thrust on the rifle in the form of measurable recoil.

Recoil of this magnitude is no joke. Here we see the result of 70+ pounds of recoil energy. The gun here is a 6¼-pound, 3½-inch, 12 gauge shotgun shooting a 2¼-ounce load of shot. Ouch!

For example, a 12-pound varmint rifle weighs 1,680 times more than the 50-grain bullet it shoots. Recoil in foot pounds of energy, in this case, would be less than 5 pounds. By extreme contrast, let's look at a turkey gun that I recently tested for recoil. A hunter brought the gun to me — a very tightly choked, single-shot 12 gauge, 3½-inch magnum weighing but 6¼ pounds. The hunter's arm was black and blue from his biceps muscle to his elbow — the result of a few awkward shots he had made with the recoil pad too low on his shoulder. He was shooting a 2½-ounce load of shot in this 6¼-pound gun that translates to the gun weighing only 45 times more than the shot load. This combination produced a whopping 70+ foot pounds of recoil energy and, unless you've experienced such punishment behind a gun, you may find it to be extremely unpleasant.

An 8-pound rifle in caliber .25-06 shooting a 120-grain bullet at 3,000 fps will produce about 12½ foot pounds of recoil energy. This is a sharp jolt to the



(L) Comparison of two very different muzzle brakes: Bottom shows Oakland Arms muzzle brake installed on .25-06 varmint barrel. Top brake is installed on a 12 gauge shotgun which was once a variable choke and muzzle brake combination. (R) The Browning "BOSS" Ballistic Optimizing Shooting System. This is a muzzle brake installed on a rifle in conjunction with a system to adjust barrel vibration and thereby enhance accuracy according to the bullet being shot.

shoulder for the average varmint hunter who shoots dozens of rounds at one place ... far more than the minuscule kick with the muzzle brake on my rifle (now under 5 pounds of recoil with the 75-grain Hornady bullet).

But I often tote some heavy kickers afield in quest of the wily, winter canine predators whose cunning often keeps them far from my guns. I shoot a 120-grain bullet from a 7mm Remington Magnum or a 125-grain bullet from a .300 Winchester Magnum. These and other guns tend to deliver ample kick to my shoulder as I lie prone in the snow.

Recoil is regarded as a necessary evil by some shooters who promptly take measures to cope with it in different ways. The muzzle brake or compensator does the trick for many. The muzzle brake installed on my rifle by Oakland Custom Arms was an excellent piece of work. Even at very careful inspection, it is almost impossible to see where the 2.58 inch long brake — attached by a threaded union — joins the barrel. The professionally blued barrel and brake go well together. As shown in the picture, there are nine oval slots in the brake and these measure 0.180" wide by 0.475" long. The muzzle opening is 0.280" in diameter. The actual muzzle brake extends 1 1/2 inches beyond the original rifle muzzle which measures 0.845" diameter on this varmint barrel.

Muzzle Brake Increases Sound Level to Shooter

Along with the benefit of recoil reduction, I had two thoughts regarding the muzzle brake — one being the degree of increased muzzle blast I would experience, and the influence, if any, on overall rifle accuracy. John Anderson suggested that I try a sound level meter in conjunction with the muzzle brake to monitor muzzle blast. I purchased a Digital Sound Level Meter from Radio Shack for this purpose. The unit has a three-digit liquid crystal display which shows sound in decibels from as low as 50 dB to 126 dB SPL, with seven ranges. The unit can be set to integrated mode that measures the integrated average, and holds maximum and minimum sound levels for a preset period. It also shows when the sound level reading is under or over the selected range. The meter operates on a 9-volt battery and is adaptable to a camera tripod; actually, it is a very versatile unit.

Unfortunately, muzzle blast exceeded the usable scale on the sound

TABLE 1

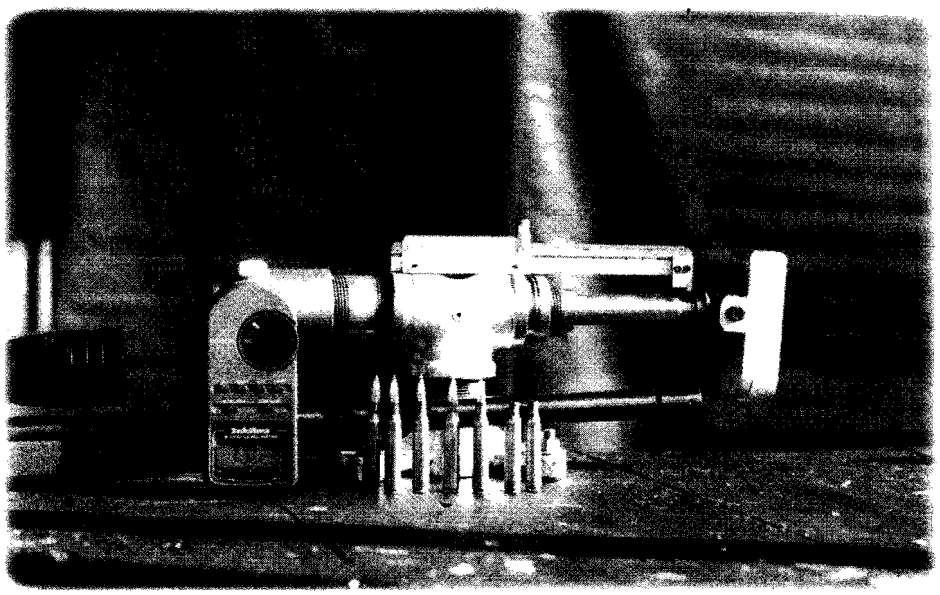
Gun wt/lb	Cal.	Load	Remarks	Recoil/ft-lb
9.5	.25-06	75-gr.	W/muzzle brake	3.6
9.0	.22-250	50-gr.		6.1
9.5	.25-06	75-gr.	No muzzle brake	8
9.3	.270 WCF	150-gr.		9
8.4	12 gauge	2¾"	1⅛ oz. shot	12.5
7.5	20 gauge	3" Magnum	Factory load	13.0
6.0	12 gauge	2¾"	heavy game load	16
5.5	12 gauge	l-oz. slug		17
5.5	12 gauge	2¾"	1¼ oz. shot	24
8.5	.300 Wby. Mag.	180-gr.		30
5.5	12 gauge	3" Mag.	1¼ oz. slug	33
8.0	12 gauge	3" Mag.	1⅞ oz. shot	37
6.0	12 gauge	3" Mag.	1¼ oz. slug	45
6.25	12 gauge	3½" Mag.	2 oz. shot	55
6.25	12 gauge	3½" Mag.	2¼ oz. shot	70

level meter when placed by the shooter, so I positioned it well back from my seated position to get comparative readings. Using a sound filter didn't appear to help so as a make-do system it functioned quite well directly back of me.

As closely as I could determine, the sound level was increased by about 30 percent on my .25-06 after the installation of the muzzle brake. I am sure this could vary between cartridges. With the muzzle brake I used the foam-type plugs offered by E.A.R. Corporation which seemed to attenuate the increased sound well enough. However, I could now feel the muzzle blast quite pronounced against my face. Neither the increased sound or the felt muzzle blast were objectionable to me for short periods of shooting but one's tolerance level may break down with extended shooting. Using added hearing protection would be wise when shooting with a muzzle brake or compensator, however.

We must be aware that measured sound in decibels is logarithmic with increases factored, multiplied by 10. This means a sound of 50 dB is twice as loud as a sound of 40 dB, etc. The sound produced by firearms results in an accumulative, irreversible damage to the hearing, and adequate hearing protection is a must. As we install a muzzle brake or compensator such protective measures must be increased accordingly.

The aforementioned load using 48 grains of XMR 4064 powder in the .25-06, along with the 75-grain Hornady V-Max bullet, produced outstanding accu-



These are some of the items used by the author to test for gun recoil and sound produced by muzzle blast. From left: Scoped rifle with barrel extended showing Oakland Custom Arms muzzle brake. Radio Shack sound level meter that shows digital readout of sound in decibels. Top shows dynamometer designed and built by author for measuring gun recoil in actual foot pounds of energy. Unit is firmly bolted to a permanent shooting bench during use. This instrument is designed to measure the recoil in foot pounds from the lowly .22 rifle to the hardest kickers.

The author tested a TCR '83 rifle in caliber .25-06 Remington with Oakland Custom Arms muzzle brake installed.

racy prior to the installation of the muzzle brake. From an accuracy standpoint, I did have some experience with a muzzle brake that I installed on a 12 gauge shotgun slug barrel. I had been using Federal 1-ounce rifled slugs (not sabots) in this barrel that performed very well on the single-shot TCR '83 receiver. But recoil was a bit heavy at around 23 foot pounds. Five-shot groups at 50 yards were averaging under 2 inches, which is outstanding, and I had shot a deer at 135 yards with a perfect center lung shot. Grouping immediately following the muzzle brake installation actually showed some improvement, with groups just under 2 inches at 50 yards and 4 inches at 100 yards. This is outstanding for a smooth bore shotgun and "Foster-type" slugs.

As I tested the .25-06 with the muzzle brake I actually was anticipating some improvement in accuracy, even though reports to the contrary are often seen. In theory, reduced recoil should improve accuracy but such recoil is essentially unfelt until the bullet is well on its way. The circumferential gases in the area of the muzzle and muzzle brake apparently cause little, if any, disturbance to the passing bullet even though these gases are at a higher velocity than the bullet, per se.

Anyway, grouping with the .25-06 remained excellent, with some groups significantly smaller than before the brake installation. This, however, could be a fortuitous occurrence, but nonetheless encouraging.

In summation, I believe either a muzzle brake or compensator does, indeed, offer advantages for many shooters. Where a varmint hunter wants to observe bullet impact, this advantage speaks for itself. Recoil reduction for many is no small matter either, making shooting much more pleasant. Each shooter must weigh the effects of increased noise level against the possible 60 percent reduced recoil on some guns. Personally, I could justify the cost of having less kick on many of my guns. Most of us have been kicked around long enough anyway.

Nasty Stuff

A man recently went around alarming the citizenry by graphically describing the dangers of dihydrogen monoxide. The stuff causes thousands of drownings a year, can lead to excessive sweating and vomiting, and causes considerable land erosion. He got many people to agree that the substance should be banned.

Actually, what this man was doing was showing how ignorant the public is of environmental matters, because dihydrogen monoxide is water. He operated the way many radical environmental groups do, by using alarmist rhetoric and taking advantage of naive and gullible people.