

## REDUCING RECOIL

Dear Technoid:

I recently purchased a Mossberg 835 Ulti-Mag. I bought this beast because I do a fair amount of waterfowl hunting in salt water and always hated to take any of my "good" guns to get rusty and corroded, plus they have a reputation for being tough. Also, I figured since this gun takes the 3.5 inch shell, it could serve as a duck-goose-turkey getter. I took it to the skeet range to see how it shoots and was very happy with the feel and "shootability" with one exception; it kicks the bananas out of me, even with light loads.

I brought this up with several "experts" at the range and most say it is gun fit. The stock has too much drop, the stock has not enough cast, etc. All I know is the damn thing hurts. I would like to address this problem myself without going to a local gunsmith mainly because I am cheap but also I would like to learn something about recoil management and gun design. There must have been tons written on this subject, which leads to my question. Can you recommend a book on recoil control and management in shotguns? I am not only interested in stock design but also muzzle and barrel modifications.

Thanks a bunch for the help.

Jerry

Dear Jerry:

Aha! The *forza bruta* approach to waterfowling. It is only a shame that the duck season does not coincide with the Fourth of July. 3.5" whoppers out of a light weight gun- "You're a better man than I, Gunga Din.", as Rudyard the K. said.

Of course, I can afford to be flip about your predicament because I too went that route. My folly only embraced the 3" Mossberg pump, but the idea was the same. It was a lot like the hunter shooting the elephant- small man, large animal- gun goes off- first one to get up wins.

I don't know of any literature specifically devoted to the reduction of recoil from sporting shotguns that is not commercially biased. Everyone has an axe to grind and a product to sell. If you go to Vandalia to the Grand Trap shoot, you will note that an entire industry has grown up around the tender shoulders and bruised faces of trap shooters. As I do not have a product to sell, and my axe has already been ground down to a nubbin, here are my priceless thoughts on recoil reduction.

There are two types of recoil- Free recoil and what I will call felt recoil. Free recoil is what the standard recoil formula gives you. Felt recoil is what you as a human actually feel. Felt recoil may or may not depend all or partly on free recoil. Free recoil never depends at all on felt recoil.

The ingredients of free recoil are 1) weight of gun, 2) weight of ejecta (shot, wad and weight of powder), 3) speed of ejecta and gas velocity (A constant is used here. It does not vary and we

cannot affect it, so we won't worry about it.) There are no other ingredients- no porting, no fancy stocks, no slow powders.

Ergo, in order to lower free recoil you can increase the weight of the gun, lower the weight of the shot charge or decrease the speed of the shot charge. That's it. Ain't no more. Since you insist on shooting those Roman candles, the ONLY thing that you can do to reduce free recoil is to increase the weight of your gun. The best way to do that is just to add a big chunk of shaped lead inside the magazine tube (in place of the Federal plug) and then one to balance in the stock. Make sure to anchor the lead because it will play havoc if it gets loose on you. Get as much lead in there as you can. That Mossberg is quite light. Adding a bunch of weight to either end of the gun will drastically change your moment of inertia (ease of starting and stopping your swing), but it is either that or get pounded down through the bottom of your duck boat. Forget about mercury recoil reducers or spring loaded ones. Just use lead. It works just as well, you can get more of it in there and is a ton cheaper.

That is it for free recoil. You can do a lot more with felt recoil and that is going to be more important to you. After dealing as much as possible with free recoil, the two main methods of lowering felt recoil are: 1) space out the recoil and 2) dodge the recoil. Here is what I mean.

Spacing out the recoil: View the recoil energy of your gun as a curve on a graph. A fixed breech shotgun (like your Mossberg pump) has a recoil curve that looks sort of like a traffic cone- tall and pointy. A gas operated semi-automatic shotgun has a recoil curve that looks a bit more like a camel's back- the curve is lower, longer and has two rounded humps. In guns of the same weight and shooting the same shell, the area under both curves will be the same. Free recoil is identical. Mr. Newton's Nth law of motion is inviolable. You cannot change the area under the curve (free recoil), but you can change the shape of the curve (felt recoil) and that may govern how you perceive the recoil.

The fixed breech gun (like your pump) gives you an uncomfortable jab all at once. The gas gun gives you more of a shove with two small peaks- cartridge ignition and then a tiny moment later the thump of the action being forced fully rearward. Gas gun recoil is the same, but what you feel is less because you are getting a shove. The recoil is spaced out more and that makes it feel more comfortable.

What can you do to space the recoil out more (without buying a gas gun)? Not too much without getting extremely fancy and using pneumatic struts in the stock. A good recoil pad will do wonders- Kickeez makes one of the best. I would strongly recommend this. Many people also say that using a slower powder (if you reload) gives more of a push than a jab, but I have never been able to notice it at all. You have to use more of the slow powder and that increases free recoil.

Will barrel modifications help reduce felt recoil? Bob Brister's book says 'yes', Tom Roster's book says 'no'. The Technoid (book under construction) says 'usually no'. Here is my analysis for each modification:

Barrel porting: It may slightly reduce muzzle jump, but has absolutely no effect on rearward recoil. I don't care what the manufacturers claim. It does not reduce rearward recoil. I have tried just about every kind of porting around and really cannot tell any difference at all. Other people, especially pigeon shooters, port their gun to reduce muzzle lift for a quick second shot. They think it helps, especially with those heavy pigeon loads. Since you are shooting the extremely heavy 3.5" shells, barrel lift should be noticeably reduced. Barrel lift reduction might actually matter if it were not for the fact that you have to pump the gun between shots. The pumping action makes barrel jump reduction moot. Barrel lift reduction has nothing to do with reduction of rearward recoil.

I have also used the caged Poly Choke and the Cutts Compensator. The cage on the Poly Choke made no noticeable difference to rearward recoil on my 1100 (really sort of hard to tell on a gas gun), but the Cutts Compensator absolutely, positively did help reduce felt recoil on my Remington 870 pump. Subjectively I remember it as a felt recoil reduction of over 10%. Using a Cutts in the duck blind will definitely get you banished. They are really LOUD.

Backboring: I just cannot make up my mind about this one. Browning now ships all their Citori models with overbore barrels, claiming that the big bores increase velocity, lower shot deformation and lower felt recoil. The higher end Belgian Brownings are made with standard barrels, so apparently Browning is hedging their bet. Beretta feels that standard diameter barrels are better, but ships with lengthened forcing cones, which Browning does not. None of the really expensive, high grade guns are backbored. Roster doesn't think backboring helps, Brister and writer/gunsmith Stan Baker do.

The problem is that it is just plain hard to compare apples to apples. Some of the backbored guns I have owned (Krieghoffs, for example) were very soft shooting. That may be due more to other areas of the design than the .735" barrels. Then again, I have never shot a Krieghoff that was not backbored (Their ULM pigeon gun is actually under bore, but I never shot one.).

I have shot a whole bunch of back bored Citoris and some were soft and some were not. I have had two Belgian Brownings backbored and could detect no difference in recoil after the operation. In a real apples to apples test, I swapped barrels on my Beretta 303 between one that was stock (.722" ID) and one that was backbored (.735"), coned, ported and also with ported screw chokes. The modified barrel was definitely softer shooting, but I don't know which modification helped the most.

While I have had varied results with backboring for reducing recoil, I have always felt that lengthening the forcing cones produced a small, but measurable, reduction in felt recoil. Roster says that the ideal cone length is 1.5", but my experience is that longer cones permit better polishing. I get them as long as I can. The Shotgun Shop does a wonderful job. I don't know what length cones Mossberg is using in your gun.

Dodging recoil: I have saved the most important aspect of felt recoil until the end- Stock Fit. An ill fitting stock can make a .410 feel like a Ma Deuce cal. .50. A perfectly fit stock can help tame felt recoil to a large extent because it will let the stock slide past your face and deliver the recoil

to your shoulder where it belongs. This is what I mean by dodging recoil. Your shoulder can take a lot of pounding, but catching all the recoil in your chops gets old fast.

You say that you feel that your stock is too low and does not have enough cast. For maximum reduction of facial slap felt recoil, my guess (without seeing you and the gun together- this is really winging it) is that your stock is too short and too low, but that the zero cast (common on American pumps and autos) is just right.

Cast off actually increases recoil to the face in the form of face slap. For years, almost all American-made guns had no cast. Today that is true for all of our autos and pumps. Universally, very few trap guns are cast. Why? you ask sagaciously. Because cast off increases face slap. The idea behind cast off is to better align the eye over the rib when the shooter insists on shooting with an erect head. Most American tend to crawl their stocks more than the Europeans. When you push your face forward on the stock, the need for cast off disappears for most people. Matt Dryke, Dan Carlisle, Phil Murry, Kaye Ohye, Dan Bonillas- all crawl forward on zero cast guns.

Sporting clays, with its British influence, has always pushed cast as the solution to head alignment. It does work for many, but at the price of face slap for some. Under recoil, a stock with no cast comes straight back, sliding along the shooters cheek. Now, pretend that you have a very heavily cast off stock- one that is bent out from the face several inches. Under recoil, it too will come straight back, but the stock is now at more of a right angle to your face and it will smack you in the chops rather than slide right on by. Smaller and more normal amounts of cast off also do this to many shooters, just to a lesser degree. In a high recoiling gun like your Mossberg, even a little cast may cause you a lot of face pain. Carefully test your gun for point of impact. Assuming that you are right handed, add cast only if you are shooting to the left of the target and cannot cure that by moving your head forward on the stock.

Stock drop is sort of the same as cast. The closer that you can get the top of your stock to being parallel to the rib (as with a Monte Carlo comb) the more likely the stock is to slide along your face, rather than slap it. The more drop your stock has from comb to heel, the more face slap you will take. Notice that stock drop and stock height are two different things. Height is the relation that your eye has to the rib, drop is the angle of the comb of the stock. Field guns like yours, unfortunately, need a bit of drop to compensate for the various angles required for game shooting. Ideally, you want the minimum amount of difference between comb height and heel height that will still permit you to comfortably shoot flat incomers and also directly overhead. You will have to compromise here.

Pitch: Pitch is the angle of the butt. Zero pitch (butt at a right angle to the rib) is common on trap guns and is the best way to reduce face slap. Unfortunately, it is also the best way to have the gun slide off of your shoulder when you shoot. Extreme pitch, 4" to 6" inches, will force your gun to recoil back and up into your face. The stock will stay in place, but your face will not. Most guns like your Mossberg come with around 1.5" of pitch and you should probably leave it alone.

Stock length is the final adjustment that you should consider to reduce felt recoil. The longer the stock, the less it appears to kick. This is because longer stocks necessarily are held to the

shoulder tighter. The surest way to drastically increase recoil is to mount the gun softly. That gives the gun a running start before it hits you. Shoot the longest stock that you can comfortably manage for overhead shots. Overhead is where you can easily tell if it is too long.

So, there it is. This is probably more than you (or any of our other readers) ever wanted to know about recoil. Remember also, this is just one person's experience. Then again- that experience is from the Technoid- whose words are chiseled in granite. Well, sometimes.

Best regards,  
Bruce Buck  
Shotgun Report's Technoid