

Tweaking the Air Arms S200

By Ian Pellant

tweak: **1.** To pinch, pluck or twist sharply. **2.** *Slang.* In motor racing to tune (a car or engine) finely for peak performance.

It only took a few weeks before the urge to tweak my Air Arms S200 (a.k.a. CZ 200 S) became irresistible. It all began with the stock.

The Stock

I enjoy target shooting from a standing position, and when doing so, I hold the rifle with my right hand whilst loading a pellet with my left. Hold the gun in the right hand with the butt under the arm and load with the left hand, was the way I was taught to handle air rifles (and break action shotguns). This technique keeps the gun almost continually held by the right arm. However, a problem soon developed with the S200... my right hand was becoming very sore in two places. The inside upper edge of my forefinger and the inside edge of my thumb were both suffering bruising from hard edges on the rifle stock. This is something I have never experienced before and it caught me by surprise.

My first attempt to modify the stock was mildly successful. A simple sanding back of the timber under the action block in front of the pistol grip followed by a touch up with stain and oil helped a little. But: my thumb was complaining about the sharp edge it was wrapping over behind the action and my trigger finger was grumping about a sharp edge it was traversing reaching into the trigger. Time for the sanding block and some stock reshaping.

Unfortunately, most contemporary rifle stocks are finished with some combination of stain and sprayed polyurethane finish. The S200 has a finish that once it is sanded down to bare timber it exposes layers of colour stain from the top surface down to almost white wood. Most of the colour is in the stained polyurethane finish, not in the wood. These finishes are almost impossible to retouch satisfactorily once the surface has been cut and the colour has changed, so even minor sanding of the stock will require a complete strip and refinish if one is at all discerning.

The good thing about the factory finish is that it provides a clear edge marker to the newly sanded areas. The bad thing is that it all has to be removed. Several applications of paint stripper, scraper and steel wool later and the bare butt-stock timber is exposed. One surprise was how there appeared to be two different layers of finish on the stock. A light colour finish seemed to have been over-coated with a darker stained polyurethane which contained flecks of stain to emulate wood grain. What had been a bland grained stock with factory finish was seen to be a strongly grained piece of timber. I had hopes that the factory finish to the fore-end stock could be retained and the butt-stock could be refinished to be a compatible match. Seeing the true grain in the butt-stock quickly demolished that hope... the fore-end colour could not be matched and it looked very bland compared to the butt-stock, so it too fell under the paint stripper.

From photographs I have seen of other S200s it seems common that the fore-end stock will be of tight, straight grained timber, while the butt-stock is likely be from figured timber. The differences in timber graining are suppressed under the stained

polyurethane factory finish. Strip the timber and unless you use a stained finish, the differences in timber grain will become a new feature of your S200.



I used the traditional wood stain, oil and wax method to refinish the stock and decided to feature the wood grain rather than suppress it under heavy stain.

I really like Birchwood Casey "Tru-Oil" because it is an

accelerated oil finish. It dries within 2 hours, so rubbing and re-coating can be done several times a day. Many thin coats of oil are needed to fill the grain... I lost count somewhere over a dozen coats; there is no shortcut to a filled grain oil finish. Of course, a much simpler finish can be achieved with only three coats of oil which leaves a pronounced open grain surface.

After the final oil coat and rub back with steel wool, came several coats of Birchwood Casey Gun Stock Wax. The result is a deep, lustrous satin finish with a silky feel. It is also easy to touch up and refinish at any time after minor mishaps (such as when dropping the heavy quick connect on the charging hose onto the fore-end stock!).

If you have an S200, you may notice the reshaped edge to the flat beneath the bolt. It is not a very big change to the stock, neither are the modifications done to the other side where the forefinger makes contact. I did the modifications asymmetrically, so that by holding the rifle by left instead of right hand, the differences can be felt. The S200 stock design has several very sharp changes in surface direction which have mostly been preserved, but now feel softer under the oil and wax finish.

Be warned however that the S200 may require a slotted nut driver to remove the butt-stock from the action and that the butt plate may be glued to a thin packer that may be glued to the butt timber. Just removing the butt-stock and preparing it for stripping takes commitment.

A peculiarity of the CZ 200 fore-end stock is that it may seem a little loose because it is retained by a single screw at the rear. The front of the stock contains a clear plastic cylinder support insert that performs double duty by holding the stock to the air cylinder. The cylinder is quite solidly held by its end screwed into the action block. If the fore-end

is loose, check the fit and position of the support insert. Another quirk is the fore-end stock screw. It does not need to be tightened beyond a snug fit. The stock is held laterally by its fit over the sides of the action block and a little by the front sight block; the screw merely pulls the stock close to the action. One of my gripes with the rifle is that the air cylinder fits very close to the barrel and is difficult to remove from the rifle with the muzzle fitting attached to the barrel. There is just not enough clearance to get the air cylinder out without rubbing the muzzle fitting... that is unless you pull the front of the fore-end away from the barrel... which is easy to do if the stock screw is not very tight. In fact, closer examination shows that the fore-end stock has been cut a lot more than would seem necessary to clear the front of the trigger guard. This implies that the stock was designed to be pivoted down a little to provide easier removal of the air cylinder; but it cannot pivot if the screw is very tight. Replacing the hard factory fitted washer to the stock screw with a soft nylon washer or even an O-Ring would provide the pivot capability with snug retention and allow for simpler air cylinder removal.

Power Curve

It took the better part of two weeks to strip and refinish the timber stocks (it is a job that cannot be hurried). During this time, the rifle action with the big red dab on the power adjusting screw was there to haunt me. With the factory settings, my S200 had a hump in the power curve that started as low as 10.25 fp muzzle energy, then crept up to just over 12 fp after 30 shots. The total number of shots was higher than expected and the slow rise to maximum from a full air fill all indicated that there was insufficient striker force to open the firing valve fully when the static pressure was high.

There are two power adjusters on the CZ 200. The primary controller is the spring pre-compression on the main spring driving the striker; the secondary adjustment is the venturi screw on the RHS of the action. The striker spring is factory set and sealed with a red dab to emphasize that the user should not change the setting; to do so can have legal ramifications in countries where muzzle energy restrictions apply. In the United States, we do not have such restrictions and since I had purchased a "FAC" spring as an accessory with the rifle, it was time to experiment. (The "FAC" spring requires the rifle to have a Fire Arm Certificate in the UK because it readily exceeds the 12 fp muzzle energy limit.)

The factory red dab is easily removed with acetone /acrylic thinner (or the wives' nail polish remover) from the adjustment screw. The screw on my rifle had been set 2mm in from the rear of the action block, with the slot aligned vertically. I simply replaced the 16 Joule factory spring with the FAC spring, noting that the wire gauge was heavier, it is wound in the opposite direction and is a bright white finish compared to dull black. There is no chance of confusing which spring is which.

With the FAC spring fitted and the adjustment screw set flush with the rear of the action block, first shots with a full charge of 190 bar were over 12.25 fp. Power quickly rose to over 13 fp in the first ten shots or so. However, higher power with the accompanying higher noise and air consumption were not my current objectives, so: use the secondary adjustment to moderate it. The venturi screw has a tapered point; screw it in and it constricts the air passage from cylinder to breech; screw it out and it opens the passage. It can adjust the muzzle energy of the rifle over a range of about 4 fp. I screwed it in till the muzzle energy dropped to just under 12 fp.

Now came the tedious task of shooting long shot strings to determine the new power

curve. A shortcoming in my chronographs and software was that I had no instant way to see muzzle energy over a long sequence of shots. Writing a new software that can run on my ancient DOS lap top computer provided the needed tool... Back to the testing and some most interesting results.

My general findings are that by increasing striker spring pre-compress (either by heavier spring, or screwing the adjuster in) and then restricting the venturi to balance the muzzle energy back to the original, a flatter power curve results at the cost of lower total number of shots.

Typically, my S200 now starts at a little over 11 fp from a full charge at 190 bar, then quickly rises to 12 fp over the next 10 shots where it stays quite closely for the next 40 shots before dropping again. This provides 55 useful shots with less than 1fp extreme spread. This is "tighter" and a "flatter" power curve than the factory settings.

The interaction of striker force and venturi constriction is a delicate balance. If you have the equipment or a willing airgunsmith it may be possible to tune your rifle a little finer than it came out of the box.

Please note that pellet choice will affect muzzle energy. For reasons that I cannot fully quantify, my .22 S200 when tuned for 12 fp with Gamo Match / Daisy Max Speed and Gamo Hunter pellets will only produce 11 to 11.25 fp with RWS Hobby, Super Dome, Super Point and Super Hollow Point pellets. Crosman Premiers are way down at 10.5 fp. With JSB (Johan Shulz Bohumin, Czech Republic) pellets, my rifle produces 12.25 fp with the same settings. This is a thorny problem. If your rifle has been set optimally for the Czech pellets, it may be a poor performer with Crosman and RWS pellets. If it has been tuned for almost anything other than the Czech pellets, then using the Czech pellets may put you over the legal limit. Fortunately, the easily accessible venturi adjustment screw provides sufficient power range to tune for your favorite pellets, as long as you have a chronograph handy.

JSB pellets are exceptionally good performers, made from a soft lead that quickly conforms to the barrel rifling for good air seal and low friction. These pellets appear under several English brand names.

Barrel Cleaning and Dirty Pellets

A clean bore is necessary for optimum performance. Using inappropriate cleaning methods can damage an air rifle bore. The CZ 200 instruction booklet contains excellent advice on how to safely clean the bore using a loop of nylon fishing line. An enhanced method is to find a length of plastic tubing that will fit inside the bore and then pass the ends of the fishing line loop through the tube. It is then much simpler to insert the tube in the muzzle and push it down to the breech than trying to coerce a bare loop of nylon down a moist or dirty bore. (Leave the fishing line inside the tube; it will last a very long time.)

Almost all new air rifles have a deposit of factory gunk in the bore that takes a while to both clean and shoot out. Several hundred pellets down a bore seem to have some polishing effect. My S200 had significant grime clean from the bore with each air refill (approx. every 60 shots). After the first couple of tins (250 each), the grime diminished, so now after close to 2000 shots cleaning is only required after each 250 shot tin.

Washing and oiling some brands of pellets helps reduce bore gunk build up. Pellet

washing and lubing is a controversial issue; with many airgunners devoutly washing and oiling pellets and shunning bore cleaning. Personally, I have found little quantifiable evidence to warrant the effort with some pellet brands. Other brands are so dirty out of the box with lots of loose swarf that cleaning is mandatory just for peace of mind and clean fingers. One test series I did with Gamo pellets from the same tin - half washed and oiled, the others au naturale, showed insignificant differences in muzzle energy and consistency when shot from the S200. But there was one odd difference: the oiled pellets gave a slightly more subdued muzzle noise... perhaps the oil mist changes the density of the air, increasing its relative speed of sound? I don't know.

For pellet washing, I do not like to use water because it is tedious to dry the pellets, especially the moisture trapped inside the skirt. Oven drying and hair blow dryers can speed things up... but then it's still a lot of fuss. I prefer to drop the pellets into a jar, cover them with meths (denatured / rubbing alcohol in the US) and swirl them about, then drain and tip the pellets out onto a paper towel, roll them about, pick out any obvious deformities and then leave them to dry. Alcohol evaporates quicker than water; also the alcohol will not oxidise the lead. I once made the blunder of washing some Copperhead pellets in water because they were dirty to handle and then did not dry them properly before tipping them back into their plastic box. A month later, the pellets had oxidised so badly I tossed them into the reclaimer bucket.

Pellet oiling is best done with a non-petroleum based / high flash point / non-combustible lubricant, especially if the pellets are to be used in a piston airgun. Everyone seems to have their favorite brands of oil, but it all depends upon availability. Airgun "Chamber" oils from RWS, Beeman, etc are good choices, so are some silicon based fishing reel oils

I also weigh a sampling of pellets from each new tin and write the weight under the lid. Most modern pellets are quite consistent within the same tin, but tins do vary often between batches. A 1/10 grain difference in weight between batches is quite common and is significant in muzzle energy calculations.

Trigger

I had adjusted the trigger to be minimal travel, single stage pull within a few days of being new. It has not significantly changed since after many, many shots. It may be a little smoother than it was when new, because now it is the proverbial "smooth as glass".

However, the CZ trigger is a bit different in design from most British triggers and has a different adjustment logic. As I noted in the CZ 200 review, there are three screws for trigger adjustment and the tension adjusting spring may be wound onto the adjusting screw thread. If your trigger feels gritty, check the spring position.

The Hill Pump

Initial testing with the S200 indicated that the pressure gauge on my Hill pump was reading about 10 bar low. Filling to an indicated 190 bar was more like 200 bar, at which pressure the rifle was becoming valve locked and needed many shots to bleed off the excess.

I mentioned this to the importer and Ernest Hill Ltd. very quickly dispatched a replacement gauge. This new gauge read 10 bar higher than the first gauge, so I

assumed it to be correct and returned the original gauge to the importer so he could perform an "autopsy".



The gauges appear to be of the same

manufacture, but are of a different production run as evident from the scale markings. (The replacement gauge is fitted to the pump in this photo.)

With a bit of breaking in and a more correct pressure gauge, a fill to 190 bar is now quite achievable.

However, the "drunken pump" continually falling on its face on a soft floor was really annoying me to the point where something just had to be done.

Removing the base plate screws and then moving the pump around on the base sitting on carpet showed that a position 15mm back from the factory position was much more stable.

A new pair of holes was drilled and countersunk in the base plate and the pump will now stand unattended on carpet... it really was a nuisance!

One thing that did concern me was discovering corrosion starting on the inside of the hose fitting to the pump where it enters the base. Using a can of compressed "air" dust remover, I blew moisture out of the hose and from the base of the pump. The pump has been used in the humid summer US South, so atmospheric moisture has been high. Aware of the problem, I now remove the hose and blow any trapped moisture out of it and the pump base after each day's use.

Scopes

The scope mounting system using Tasco adapter blocks has worked well, but for the exceptions of the Tasco 4x 40 and then the BSA 6-24x 40 "Air Rifle" scope (looks like the "Contender" model). The Tasco scope has a limited vertical reticule adjustment that makes it impossible to zero in without using an adjustable scope mount. I tried packing the rear ring and still could not get the scope to zero in. Oh well, relegate it back to another rifle with an adjustable scope mount. The BSA scope seemed to be okay until I used it for some long range testing at 50 yards. The scope would not adjust up to the target. I was dismayed to find that the last turn on the turret knob doesn't move the reticule... this is not a favorite scope because of mediocre optics, so it doesn't get used

much. Packing the rear scope ring improves the zero capability, but it really needs an adjustable mount.

Scope mounting on the CZ 200 requires separate scope rings. One piece mounts are not a good fit and most adjustable scope mounts are one piece. If you have a scope with limited vertical reticule adjustment then you just may have problems as I have had.

Tasco Accu Dot, Bushnell Sportview 3-9x 32 and BSA Air Rifle 3-12x 44 sights have all worked well out to 50 yards, which is an extreme range for a 12fp .22 air rifle. Trajectory drop is not quite such a significant problem as is wind drift. The slightest breeze will drift the pellet several tens of millimetres off target, much more so than a similar powered .177. To be realistic and tune the S200 as a hunter zeroed at 25 yards then the scope vertical adjustment should not be a problem.

Conclusion

I remain very impressed with the CZ 200 air rifle concept. Tweaking the woodwork on my rifle has literally made it a smoother feeling gun and has given it a more distinctive appearance.

Tuning the power curve to give a consistent shot series just under 12.0 foot pounds proved to be more finicky than I had expected. And the differences in pellet brand muzzle energy performance was a little surprising, all of which leaves me wondering just how well tuned the standard out of the box S200 is in the UK. Perhaps many are just popping along at 10.5 foot pounds.

Accuracy in still conditions out to 50 yards is outstanding. But if I really need to push the performance envelope to that range, then a couple of turns on the striker adjustment screw and a tweak on the venturi would produce an 18 fp air rifle. But then again, I don't need the extra power most of the time... Fitting the FAC spring was a worthwhile option because the rifle can still be tuned down under 12fp to give a flat power curve, or it can be tuned up to give more power (where legally allowed).

What next? The July 2002 Airgun World shows Nick Jenkinson removing the air cylinder from the rifle and fitting the quick connect adapter directly to a Hill pump for recharging. I wonder if that's because someone forgot to send the hose with the pump, or whether it really is a good way to eliminate that pesky hose sticking out of the front of the pump... Now if I just fit that fore-end stock screw with a flexible washer to facilitate cylinder removal...

No doubt, there is more tweaking of my S200 yet to come.