

WHAT IS ACTION TRUING?

*To be sure of the shot, you need to be sure of the rifle.
Photo Ren Apatu*

From the Gunsmith's Bench BY DEAN MAISEY

Back in R&R issue May/June 2012, we looked at rifle actions in general and particularly some of the problems common in mass-produced factory grade rifle actions. In this 'Part 2', we deal specifically with action truing - sometimes called blueprinting - which involves re-machining critical surfaces.

In the earlier article, we identified some problems - now we will discuss how to get things straightened out and why we need to. In the May/June issue we had an action/receiver that had problems with concentricity between all of the major reference points - the bolt raceway, the receiver threads, the receiver face, and the receiver outer surface (although this last one is less critical). What we need to do is re-machine the action in one set-up, so that the bolt raceway, lug seats, receiver

face and threads are all perfectly concentric and square with each other. We are also going to 'sleeve' and custom-fit the bolt so that there is no axial slop or play in the bolt fit when it's in the fully closed position.

"Why? What's the point?" In one word - accuracy. Perhaps more correctly - increasing potential accuracy and decreasing the chances of unexplained 'flyers' from otherwise good groups.

There are a multitude of things that must all perform perfectly and in unison to help to achieve

prime accuracy - any one thing can be the weak link in the chain. Chasing accuracy problems is a process of elimination, and having your factory action correctly 'trued' before fitting a new barrel is a necessary commonsense step. If done properly, it's an operation that will only ever need to be done once. The main things we are trying to achieve are a good solid barrel/receiver lockup (to prevent joint movement under recoil), bolt lugs that bear evenly, a receiver that has its 'under-fire' stress loadings as evenly balanced as possible and the removal of excessive axial bolt slop - which may cause erratic vibrations to be transmitted through to the barrel.

"Can't this be done later after I've fitted my new barrel as I'm on a limited budget?" No, not unless you want to risk wasting your money. Commonsense dictates that you should true the whole receiver first, then look at fitting a new custom barrel

afterwards. The main reason is that if (or usually when) you have to re-cut the action's female threads slightly oversize to get them to run true and concentric, the existing male threads on the barrel will then be a sloppy fit, and therefore negate the benefits of the trued female threads. So 'true' first, and then fit the new custom barrel. Just as there's no point putting a new head on an engine with a shonky bottom end, or a new roof on a shed with rotten framing, you must get the fundamentals right first. But you'd be surprised at what some guys do - just slap on a new barrel, keep it cheap, she'll be good! Yeah, right!

In order to start truing an action, we must start with the right reference point. Usually that means the bolt body/raceways or, in the case of a double-sleeved bolt, the ultimate reference or datum point is the firing pin tip hole. All other critical dimensions must be based around that. »

Usually we wouldn't re-machine the external surface of an action, but it would be prudent to re-bed the action/stock area after truing in order to ensure that the action is a 100% correct fit to that exact stock. Generally alloy and vee-bed block systems should be avoided on factory grade actions unless they are 'skim bedded' to compensate for any irregularities.

I use a combination of specialist action tooling from Pacific Tool & Gauge and Gre-Tan Rifles in the USA, as well as some custom tooling of my own design. I would stress again that this is not a 'how to' guide, but an overview to assist your understanding of the process.

01 On an action that will have a double sleeved bolt shaft, the first thing we do is ream the bolt raceway hole to $\varnothing 0.705$ " to standardise the hole to the same diameter front and rear (often they are different) with a special piloted reamer/mandrel. The action is then set-up in a special jig in the lathe and dialled-in to run true to within 0.0001 " along the protruding mandrel length. Now, I must emphasise here that this is no job to be attempted on cheap Chinese hobby lathes, or worn out old machines. Trying to hold under 0.0001 " tolerance as far as 12" out from the lathe's spindle face is difficult and requires a tool-room quality lathe with ultra-high precision headstock bearings in good order. We are generally talking about lathes in the \$10,000-\$40,000 price range here, which represents a significant investment for your gunsmith. Holding a 0.0001 " tolerance directly at the spindle face for a barrel chambering job however is much easier to achieve. The spindle alignment and machine set-up must also be perfect before undertaking this work.

02 Once everything's dialled-in true and secure, we remove the mandrel from the receiver and then true up the bolt lug seats by removing just the minimum amount of metal possible. The receiver's female threads are then re-cut with a single point cutter to a depth where they also



Bolt raceway is reamed to $\varnothing 0.705$ " to make it uniform and straight.



Action and reamer/mandrel are set-up in special jig in lathe and dialled-in to run true to within 0.0001 " or less.

Action is ready to be 'trued' in special jig now with reamer/mandrel removed.



Three common factory actions shown after being trued: Sako, Remington, and Weatherby Vanguard.



Bolt body being machined to accept custom-made stainless sleeves.

clean up and run true. Finally we make a truing cut on the receiver face so that we know that it is now perfectly squared with the trued receiver threads. (With a lot of factory receiver faces being ground rather than machined, it's surprising how crooked they can sometimes be. Any high spots or irregularities will cause an inferior fit of the barrel when tightened on).

03 I custom-make stainless sleeves for rifle bolts where customers want a top grade job for varmint or target shooting applications. This is far superior to the bare epoxy sleeve jobs that some guys do. Stainless sleeves will not imbed with sand or grit, will not scrape or wear off and can be machined and finished to a more exact dimension and a higher standard. The bolt is machined in the lathe utilising special fittings and then the sleeves are bonded to the bolt body using a special proprietary technique for a super-strong bond. Later the sleeves are machined and final polished to exact dimensions and then the bolt lugs and bolt face are also trued in the same set-up, again just removing the minimum amount of metal possible.

04 We then check the contact area of the bolt lugs to lug seats after truing and sometimes just a very light lapping is required to remove any faint machining imperfections. In the photo we can see the marks showing 100% contact as evidence of a job well done.

05 Washer-type recoil lugs, which are located between the barrel and receiver face, are used on numerous factory and custom rifle actions. Quite often the factory recoil lugs are uneven and also quite thin. Usually the best fix for those is to 'catalogue' them into the round bin in the corner of the workshop and replace them with a good quality custom recoil lug instead, especially if you are re-cutting the receiver threads oversize. You could spend the time to re-bore and surface grind the factory lug but often it just isn't worthwhile. There is no point re-cutting threads and truing the receiver if you don't also ensure the recoil lug is perfectly true as well.

06 In order to allow the bolt to slide and cycle freely, the non-critical contact areas of the custom bolt sleeves are carefully filed and polished back down to standard bolt body dimensions (approx. Ø0.6950"), whereas the sections directly aligned with the bolt lugs are left at Ø0.7045" front and Ø0.7047" rear. This feature is commonly known as the 'Borden bumps' style, popularised by the likes of the Nesika rifle actions and others. Why? There are a lot of

maintaining even bolt lug contact as well. This can reduce or eliminate several potential sources of inaccuracy from the completed rifle if otherwise left unchecked. Many custom actions are usually better than mass-produced factory ones, but still run bolt clearances of 0.002" to 0.004" and compared with these, the sleeved bolt (with clearances of only 0.0005" front and 0.0003" rear) is actually better aligned. On a bush rifle though this sleeved

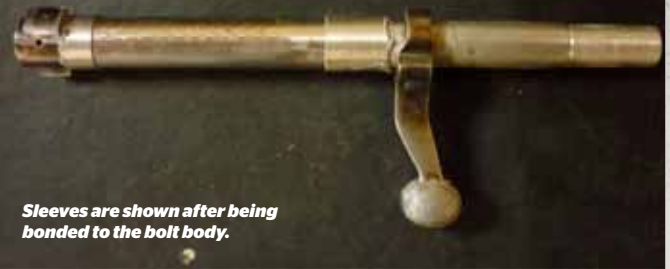
The main things we are trying to achieve are a good solid barrel/receiver lockup (to prevent joint movement under recoil), bolt lugs that bear evenly, a receiver that has its 'under-fire' stress loadings as evenly balanced as possible and the removal of excessive axial bolt slop - which may cause erratic vibrations to be transmitted through to the barrel.

actions that have an angled face on the firing pin's cocking piece, and when the rifle is fully cocked, this design tends to cause the rear of the bolt assembly to be pushed upwards and out of correct central alignment. The stainless sleeves cause the bolt body to resist the upward force and remain in correct central alignment,

bolt concept may be unnecessary, or impractical.

Once completed, the 'trued' action can then have its new custom match-grade barrel blank threaded, chambered and fitted to suit. As long as the barrel, ammo, bedding, optics and shooter are all up to standard, then the results should be very pleasing! **R&R**

Technical



Sleeves are shown after being bonded to the bolt body.



Close up view of rear sleeve after being machined and polished to final dimension to be a very close fit with trued action.



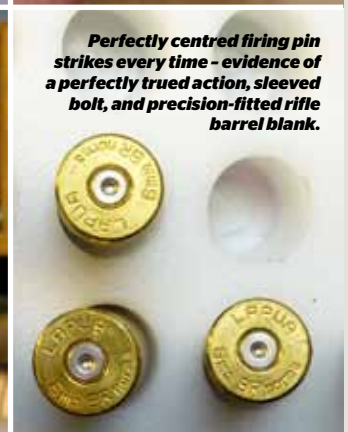
Close up view of front sleeve shown after the non-critical surfaces have been filed back down to normal bolt diameter, whereas the 'bumps' are left at the larger dimension to ensure correct alignment when the bolt is fully closed.



Trued receiver and bolt shown after a light lapping indicating 100% even lug contact.



Rear of bolt showing the angled face on the cocking piece. When fully cocked and closed, this angled engagement causes the rear of the bolt to be pushed up hard inside the receiver.



Perfectly centred firing pin strikes every time - evidence of a perfectly trued action, sleeved bolt, and precision-fitted rifle barrel blank.

D.F. Maisey Gunsmithing

Genuine Qualified Civilian Gunsmith, Graduate Colorado School of Trades-1997, Certified Smith&Wesson Armourer-Revolver-Pistol, NZDA Short F-Class National Champion 2010, 2011, 2012

SUPPLYING AND FITTING True Flite Ultra Match barrels, Bartlein (cut rifle) barrels, Barnard Actions, muzzle brake, silencers, suppressors, scope mounts, accessories, TM solution bore cleaner, (Pac-Nor barrels, Shilen, Jewell, Surgeon Rifles, McMillan stocks and other products by special order)

FULLY EQUIPPED DEDICATED GUNSMITHING MACHINE SHOP

Includes two ultra-high precision toolroom lathes for all barrel fitting, action truing and custom machining

FOR ALL YOUR PRECISION HUNTING & MATCH-WINNING RIFLE WORK Email: dean@gunsmith.co.nz / Ph/Fax: 07544 2207 / www.gunsmith.co.nz