Fitting rifle bolts.

By: Peter Laidler
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First things first. Bolts could only be fitted at Field and Base workshops because they were the only ones that had a 'GAUGE, Inspectors, Bolt'. This is a brand new, calibrated bolt. Still in white metal and marked as such. If my memory serves me right, the slot in the long/top locking lug is machined right through to identify it. So that's the reason if you have ever seen one. This bolt is bare. Clean the locking lug surfaces of the rifle and put a smear of 'engineers blue' marking dye onto the corresponding locking surfaces of the inspectors bolt. Insert this bolt RIGHT FORWARD, rotate it closed, then draw it backwards and forwards a couple of times to mark the mating locking surfaces of the rifle. Push it forwards, unlock and remove.

Examine the locking surfaces of the rifle. The blue witness marks should be evident. This ensures that whatever wear that has taken place on the rifle locking surfaces has taken place equally. If its not, then I'm afraid that the rifle is unserviceable.

BUT, that's not quite the end of the story because you won't have this 'Gauge, Inspectors, bolt' but it's only right that I tell you. Now for a little secret. If you have ever bought a rifle that has a sploge of red paint on the left side, adjacent to the internal left side locking lug, then you now know that the rifle was condemned for 'worn locking lugs'.

If you are going to fit a second hand or new bolt, then do the same thing. If the dye pattern is one sided, then stone the high surface of the bolt until BOTH locking lugs bear evenly against the locking surfaces of the corresponding surfaces in the body. BUT DO NOT ATTEMPT to stone the rifle to get a bolt to fit (you can only get to the right hand surface in any case ....). The rifle body is induction hardened at these points to a depth of .004 - .006" but we have found it deeper.

Now that you have got the bolt fitting, with the locking surface bearings matched, it's time to fit a bolt head. Any one will do. Screw it into the bare bolt and test the CHS against the .064" GO and .074" NO GO gauges. Disregard the numbers on the bolt head or treat them as a bit of a rough and ready guide but not as the bee all and end all of life as we know it! Once you have got a fitted bolt, with CHS, we'll come onto bolt head overturn.

The bolt head should not overturn the long/top locking shoulder by more than 16 degrees but if you have a No4T or L42, it should not overturn buy more than a 'few' degrees. Mine were always 'in line' through selective fitting but you won't have a big tray of bolt heads to select from! The reason for this is because over a 'few' degrees (it

doesn't define 'a few' but use 2 or 3 as your MAX), the recoil is taken on the bolt head and bolt threads. That is OK, but on an accurate No4T and L42, we want the recoil to be taken on the face of the bolt and transmitted radially, down through the bolt head and onto the front flat surface that mates up to the bolt head. Got it?

Now we have a correctly fitted bolt AND bolt head AND CHS. That wasn't painful was it? During the week, we'll go into striker protrusion, bolthead lift and anything else. But before we do, I want you to get your strikers and roll them along a flat surface (overhang the collars of course) and sift out the bent ones because they're going to cause you trouble. It's always the 1/4" BSF threaded end that's bent and you can only TRULY straighten them if you have access to a lathe.

Fitting rifle bolts, Part 2.

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Right, you have your bolt all fitted correctly and bearing evenly on the locking surfaces and bolt head giving minium overturn together with correct CHS. Now get the cocking piece and inspect it carefully. I don't want to see ANY burrs on the safety stud and while you're there, check out the corresponding safety stud in the bolt. That's the one, at the rear, between the short and long cam grooves of the bolt. At the same time, get a scraper and de-burr the long and short cam grooves too!

Now get the striker spring. It should not be less than 3.4" long. Now let's not fall out about this. If it IS shorter and the rifles fires perfectly, then so far as we were concerned, it's serviceable! But I'll come to a little test afterwards.

Select the striker that you propose using after making sure that it's perfectly straight. PLEASE, if it's not straight, the cocking piece CANNOT ever be parallel to the bolt and you WILL have problems. The striker should be a nice tight fit onto the cocking piece. I always say that it should not screw in by hand but should screw in snugly with the 'tool striker' This is because if the striker is loose on the cocking piece it WILL give you a piss poor pull-off. For the uninitiated, this is a REME technical phrase used to indicate that '....it's not quite up to the required mechanical standard old boy'!

If your striker is loose then all is not lost because you can tighten it up in two official ways ....and one of those ISN'T by coating the ----ing threads with lock-tite or super ----ing glue! Just stamp a small figure 5 on two opposite thread surfaces or clean the thread with a 60 degree thread file and put a ring of soft solder around the threads. Easy isn't it and not a bodge in sight

Before you assemble the striker, spring and cocking piece to the bolt, polish the sear face of the cocking piece in an UP and DOWN motion. You can only do this with it dis-assembled and the reason is that this is the direction that the sear operates on the face of the cocking piece. Keep it flat and DON'T over do it! Just sufficient to remove any old marks.

Coat the striker and spring with Grease XG340 ...., don't worry, any graphite grease will do, because this isn't subject to rotational forces..... and assemble to the bolt and into the cocking piece. Now, screw it in. The striker should be screwed in until the start of its thread is level with the rear surface of the cocking piece OR screwed OUT a further 1/2 turn to enable alignment with the locking screw hole.

There, you should have a bolt partially assembled. Now for the difficult part. The bolt head.

Turn the cocking piece to the fired position. DON'T let the bloody thing snap..... do it gently! Screw the bolt head down onto the striker and feel the point at which the tenon on the bolt head JUST touches the collar of the striker and starts to 'lift' the cocking piece. The total lift should be between .016" and .060". OR, put another way, the bolt head should start to life the striker and cocking piece between its last 3/4 to 1/2 turn or so. A little either way won't hurt so long as you arrive at the .016 and .060 criteria

This is an important test because it is this clearance that prevents the safety stud of the cocking piece hitting the front face of the long cam groove of the bolt and posibly shearing it. Don't forget. With the cocking piece in the FIRED position and bolt head screwed down, there MUST be a gap of between .016 and .060" between the rear face of the bolt and the front face of the cocking piece.

IF there is TOO MUCH lift, you can slightly machine down the front face of the striker collar (or get rid of any built-up burrs) or machine down the rear surface of the bolt head tenon. But whatever you do, KEEP IT SQUARE.

There, you have now got what might appear to be a perfect bolt. And you have ..., ALMOST, because next time, we'll come to setting up the striker protrusion and operating weights.

Some of you are already ahead of the game and can see by now that everything about the bolt is inter-related

Fitting rifle bolts, Part 3.

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You should now have the correctly fitted bolt assembled with the striker, spring and cocking piece, all correctly set up for what we call 'cocking piece lift'

What you now need to end up with a correctly set-up bolt assembly is striker protrusion of between .040" and .050". This is measured when the cocking piece is in the fired position ....., that is fully forward! If the striker protrusion is above .050", then it is a simple matter of stoning it down, squarely, until it is just below .050". Once it is below and correct, with a square tip, then ROUND that tip to a radius of. 038" (.076" diameter). Look, don't worry too much about this radius. As apprentices, we did it a million times until it was perfect. Suffice it to say, the tip shouldn't be SQUARE but neither should it be pointed! That's fairly obvious I hope.

Now, if it's BELOW .040", then it's time to shorten the bolt head tenon, the threaded part, against which the striker sits. This will allow the striker to protrude further through the face of the bolt head thus increasing the protrusion

BUT, already you can see that by shortening the bolt head tenon, you WILL decrease the .016" low to .060" high gap between the rear face of the bolt and front face of the cocking piece. Yes, you will, but by erring on the side of caution and getting closer to the .060" measurement to start with, you will have sufficient material left on the bolt head tenon to allow you to remove some material in order to arrive at the correct .040"low - .050" high firing pin protrusion.

From this, you'll clearly see and understand that every part of the bolt is inter-related with another. So, always head for the largest acceptable tolerance. There's a couple more items that you ought to be aware of. The striker hole in the bolt face must reject a .084" diameter gauge.

And there's something else too. We spoke about the length of the striker spring and I told you not act hastily and reject out of hand one that is shorter because another test is to weigh the operating weight of this spring. And that test is this. With the cocking piece in the fired position, the weight required to move the cocking piece rearwards should be between 7 and 9 pounds. In the cocked position, it should be between 13 and 16 pounds.

Now, we tested this with what we called the 'TESTERS, trigger, Armourers' A small spring balance with a bar and roller thinggy on one end. Now if you look at the other end of the Armourers trigger tester,

you'll see a strange hooked pressed steel thing with a rounded recess cut out of it. This rounded recess fits OVER the top of the cocking piece (it's shaped to fit the rounded No1 and No4 or flat No4 cocking piece .....) and enables the Armourer to easily test the weights of the striker spring.

There's another weight test too, that of the extractor spring. It's between 4 and 7 pounds, but practically, I don't ever remember doing one out in the real world. They either extract the drill rounds or they don't.

Now here's one last test that I always used for the No4T and L42's. Remove the extractor and smear a thin film of engineers marking blue onto the rear of the REJECT/.074" (or 1.635" for the L39/42) gauge. Then slip this gauge into the chamber. Gently close the bolt onto the gauge until you can just feel the bolt and bolt head tighten up onto the gauge. Undo the bolt and look at the bolt face. You should have a perfect circular image of the reject gauge on the bolt face. That is the acid test of bolt face being exactly square to the barrel!

There, you should have a perfectly fitting and correctly set up bolt that is crucial for accuracy. Bolt face exactly square to the bore, the load taken squarely on the face of the bolt head, transmitted radially, down and onto the full face of the bolt, to be transmitted squarely down the bolt to the locking shoulders and then squarely and evenly into the body or receiver. Don't forget, it took apprentices many weeks of constant practice using deliberately damaged bolts and components to learn this and I'm trying to get you to know it in a couple of hours. I'll take a fair bit of practice so don't worry and the best of luck!

CHS - Body and bolt wear

By: Peter Laidler

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You should all read and re-read this if you have ever thought about CHS, body wear or fitting a new bolt, especially in response to the recent thread about the matter.

I was having a chat to one of the most senior examining Armourers at a huge Base Workshops at Warminster a few days ago. Long retired, he was a 1930's apprentice and one of the very strict examiners. I was asking him about chroming bolt heads to get longer life out of heads bolts and bodies when he reported back something that was VERY interesting.

He said that during the mid 50's, there was a plan mooted to make a No4 size bolt head available so as to decrease the number of old wartime/tired/just plain worn out rifles being condemned as unfit

simply because of insufficient CHS. The alternative was to increase the MAX CHS to .078".

He was involved in this project as the research Officer, so was in from the start. The PROBLEM was that once the BOLT, Inspectors, Gauge (a calibrated slave bolt used to test wear) plus a calibrated No2 bolt head (No3 not permitted at Base/Factory don't forget) had been inserted into the inspectors gauge bolt, then making a further bolt head available was palliative and not a cure because these simple tests indicated that it was the BODY that was worn and not the bolt or the face of the barrel. And thinking about it, while it's obvious really, it's absolutely correct!

Another problem they encountered was that with the speed of wartime production, the induction hardening of the bodies was at best, mediocre, and at worst, sometimes virtually non existant. The hardening sometimes had no depth and it was tested at Base Workshops by the old IZOD impact test method. Apparently, all manufacturers were as bad or good as each other including Savage and LB (I bet that has shocked a few of you who were probably lead to believe that some makers were 'better' than others.....)

I spoke about resurfacing bolts but he just shook his head sternly and wagged his finger as if to say. 'No, it's the BODY that's worn beyond the point of no return and once the hardness is gone, then there is no cure.'

There, that's straight from the horses mouth and it doesn't come any clearer or louder than that. If you cannot get CHS with BOTH bolt lugs bearing evenly using a No3 bolt head, THEN trying a new bolt, then it is the BODY that is finished. Sorry about that.....

CHS and boltheads.... further

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In response to KimW's note. And it's this. Maybe I shopuld have included this in the last thread about worn bodies....

For all of you that want a 'tight' headspace on your No4 or 5 or 'T', by making sure the bolt JUST closes down on the 'GO' gauge using the tightest bolthead. Remember this. You aren't making the cartridge seat tighter in the chamber, all you are doing is crushing the rim tighter between the barrel and the bolt face. This is the reason why all (?) the .303" weapons were .064 GO and .074 NO-GO.

On the RIMLESS 7.62mm versions it DOES make a difference because the bolt face is closing down in the gauge or cartridge case that is seated about a point on the neck of the cartridge case. This is the reason why different 7.62mm rimless rifles all have different CHS, such as 1.6325 go and 1.643 NO GO for the L1A1 and yet another set for the Bren and 1.628 GO and 1.635 NO GO for the L42 and so on.

There's a bit more to it than that of course but that is the basics. The lesson, as I was always taught it is 'DON'T OVER CHS'. It's not needed and a waste of time so long as uit's within the gauge limits. Seems fair enough to me.....