

# Anyone for CHS?

By: Peter Laidler

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Quite why we have a thing called cartridge head space and the actual physics of it are not within the brief of this little article. What IS, is the act of CHS-ing a rifle. The first thing I ought to mention is that in Britain, certainly from the period that I was involved, from the early 60's until today, the CHS for all of our .303" service weapons was that a bolt MUST close over a gauge of .064" thickness x .5" diameter that is inserted between the front face of the bolt head and the rear face of the barrel. Naturally, both surfaces must be clean!

On the other hand, the bolt must NOT close over a gauge of .074" thickness x .5" diameter that is inserted between the front face of the bolt head and the rear face of the barrel.

We call these gauges 'CHS gauges' and for ease of use in the UK Military, take the shape of approx 1" long cut down cartridge cases..... You've all seen them! And to make things simpler still, we call them simple GO(the .064") and NO-GO(the .074") for obvious reasons. And just to clear up another ambiguity, we haven't used other sizes at any level of repair since 1948 so far as I can ascertain.....

Our gauges are 'calibrated' annually. Given that you now have your set of gauges, 'calibrating' them is quite simple. Get a micrometer, clean the rim faces of the gauges and holding the micrometer square, simply measure the thickness of the rim! Now, I've got a confession to make..... If your gauges are slightly worn to, say, .063 or 2 or, say .073 or 2, then given that there is .010" leeway anyway, does one or two thousandths of an inch make any difference? I say not but if you insist.....

Quite whether the bolt 'goes' or 'doesn't go' is dependent upon three things and THREE things alone. There is NOTHING else. They are the locking surfaces of the body, the locking surfaces of the bolt and wear on the surface or mating surfaces of the bolt/bolt head or a combination of these. There are some that will say that wear on the rear surface of the barrel is relevant. Quite HOW this wears is a mystery because it is only subject to the brass cartridge case closing up to it, albeit many thousands of times in its life..... That is only my opinion. Other Armourers say that some wear will be caused by gas wash from..... well ..... Whatever the opinions you can accept that wear IN the barrel has no bearing on CHS.

Now, to cater for the vagaries of mass production, the designers cater for two of those points, the bolt and the bolt head. Why not the body then you ask? Once again, I can only sing from the hymn sheet that I know. That's because in the UK Military, bodies were classed as the 'MASTER COMPONENT' and the master component was NEVER available from Ordnance Stores. NEVER, NIX, not EVER, contrary to what your grandma's uncle Jim who knew a bloke whose friend met someone in the NAAFI at Tidworth might have told him. It was, is and always has been a blocked VAOS number. I know that it's shown and illustrated in the parts list but just remember this. The parts list is a list of parts and not a list of AVAILABLE parts.

Now to the point of technicalities. In an IDEAL world, the world of an examination bay at the factory or a large Base Workshop, the gauges would be slipped into the breech and a completely stripped bolt and bolthead would be closed over the gauge. This is the way that it was done at Base workshops where 1000 rifles would be stripped with just the bolt and bolt head (plus the fore-end and backsight, to make life easy when reassembling after Base repair) tied to the rifle with a bit of string. It's easy then but we don't live in an ideal world, but a REAL one where the gauge is slipped in place with the rifle assembled. In this case, it's important that in order to prevent chipping the expensive gauge with the extractor, that it's slipped onto the bolt face and under the extractor, just as happens in real life. For this you've got to realize that the round is fed up into the chamber by sliding up the bolt face and under the claw of the extractor. And that is the reason why the bottom edge of the extractor is ever so very slightly rounded - , oh yes it is, just take a look....., so that it doesn't tear away at the brass case as it's sliding up the face of the bolt while being fed into the chamber and eventually clog up the breech end with brass chippings and residue! You can see now that unless you actually hand-feed a round into the chamber, then the extractor never actually clips OVER the rim of the round. The rim of the round actually slides up the bolt face and UNDER the claw.

Now that the gauge is into the chamber and the bolt is being closed, this is where the trouble lies. It's important here to remember the often said phrase among Armourers of 'DON'T OVER CHS'. Here's another thing to remember during this. Because there is a camming action operating while OPENING the bolt, called 'PRIMARY EXTRACTION' this action also operates when closing the bolt. And the same primary extraction forces that will enable the infantryman to force the bolt closed and unlock and extract a possibly distorted shell case, covered in wet silt and mud in the saltwater mangrove swamps of Johore in Malaya that's caused the case to stick hard to the chamber walls will also enable the butchers or bubbas to close the bolt hard against the gauge. NO-GO on the .074" gauge is when, using the

lightest finger and thumb action on the knob causes a slight feel of resistance.

The next question you're going to ask is '...where during the bolt closing movement is this slight feel of resistance acceptable --- Is it almost closed or, hardly closed or inbetween'? Good question and the answer in the bible reads thus: '...with a 0, 1 or 2 bolt head, there must be resistance onto the .074" gauge prior to there being a minimum of .050" from the underside of the bolt lever to the contacting point of the body socket'. Then it goes on to say '.....With a No3 bolt head the left edge.....' But I want you to forget this because the statement was too ambiguous. I suggest that you use my maxim of 'WITH ANY SIZE OF BOLT HEAD FITTED THERE MUST BE RESISTANCE OF THE BOLT ONTO THE .074" GAUGE PRIOR TO THERE BEING A MINIMUM OF .050" FROM THE UNDERSIDE OF THE BOLT LEVER TO THE CONTACTING POINT OF THE BODY SOCKET. I want the master Masons among you to learn that by rote!

Using this criteria, if a No3 bolt head starts to resist half way closed and a No2 resists at .051" from the body side, then use the No2 bolt head. Remember DON'T OVER CHS

There are a couple of reasons for this. Firstly, it is from a point when the underside of the bolt handle is approx .15" from the sharp curve between the top of the body and the side of the butt socket, that the bolt effectively ceases to move any further forwards and is effectively locked.

The second is that prior to the point of fully locking, a feature called 'mechanical safety' comes into operation and (it's getting technical now.....) the stud on the cocking piece will strike the stud between the short and long cam groove at the rear of the bolt causing a diminished force of blow to the striker, resulting in a mis-fire! Phew!

You will understand that this is a highly condensed précis of events taking in months of learning, investigating and examining undertaken by apprentices and I'm trying to cram it into a 40 minute lesson!

This brings me to another point..... I asked you to read and digest the discussion between KimW and others of some weeks ago. It's very basically this. If you cannot get headspace, even using the very relaxed criteria I have discussed here by using a new bolt and a No3 bolt head, then I'm afraid that it means your body is knackered. This quaint old Armourers technical term indicates that it's seen better days ....., it's xxxxed! You COULD allow yourself up to, say, .078" headspace but the technical opinion reached during research into this during the 50's is that it's a palliative and not a true cure.

Next, We'll discuss the odd-ball .303's such as the Vickers and the Bren plus the 7.62mm L8's, 39's, 42's and the Envoy group. Are you still in for the long haul?

## **Anyone for CHS, part 2**

**By: Peter Laidler**

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The No1 rifle is not exactly my forte as those I encountered during my service were those well worn training school examples, a few in Malaya, mainly held in mobilization stores and grenade launching and those live and DP versions held by Cadet Forces. Maybe a few thousand in total.

The mechanics of CHS for the No1 rifle is a little different. The same criteria applies but this time the last EMER dated 1956 for the No1 rifle simply states that the bolt should close over the GO .064" gauge and should not close over the .074" NO-GO gauge. Sounds simple enough to me! From this I always use the No4 rifle criteria of; THERE MUST BE RESISTANCE OF THE BOLT ONTO THE .074" GAUGE PRIOR TO THERE BEING A MINIMUM OF .050" FROM THE UNDERSIDE OF THE BOLT LEVER TO THE (its) CONTACTING POINT OF THE BODY SOCKET. So if your bolt starts to resist at .056" or so from its contacting point of the rifle body socket, then if that's good enough for the Army, it's good enough for me and hopefully you!

There has been talk of some bolts being 'ground away' on the underside of the lever. Quite why is a mystery and my older mentors are unsure why because what will eventually prevent the bolt rotating is the long cam contacting the body side as it's locked down to the right!

Spare bolt heads issued from the factory were actually oversize and marked with a small 'S' . . . . ., but nobody can tell me by how much! Other Armourers of the period have told me, only yesterday over a frantic phone call, that this is incorrect but they WERE all to the longest specification. Whatever it is/was, there should be room to stone to size. And THIS is where Armourers were always taught DON'T OVER CHS. Or in this case, should that read don't UNDER CHS. If your rifle closes on the .074" NO GO gauge, this is what you do. Go to the No1 bolt head drawer and select half a dozen bolt heads that don't overturn by more than 10 degrees (later, 15 degrees was permitted to make best use of remaining spare parts stockpiles), the bolt face is not ringed sufficient to allow the escape of gas past the primer and the striker hole is not greater than .084" dia. Try them all until you get the

best fit. If necessary machine or stone the bolt head square and true until it closes over the .064" gauge and doesn't close over the .074" gauge. The point at which the bolt doesn't close prior to the .050" limit is academic because so long as it doesn't go/close, it's passed the test.

Now, how you shorten the bolt head it is up to you. You can machine it in a lathe if you like but some are quite hard, or surface grind but I was taught that the best way was to rub the face down on a sheet of '400' wet and dry carborundum paper on a sheet of glass, just covered in slow running water. Go round and round with equal pressure, rotating the bolt head slightly every so often, taking a gnats knacker off at a time for several minutes and trying it again and again. Every so often, smear a smidgin of engineers blue on the rear of the .074" gauge and close the bolt head lightly against it to ensure a crisp round witness mark on the face of the bolt. This is the acid test of it being perfectly square to the bore. Be sure to remember these old Armourers technical words such as 'gnats knacker' meaning something too insignificant to be measured and 'smidgin', indicating a quantity equivalent to a gnats knacker.

That is very basically it! Once again, this is weeks of practice in the classroom and on the bench with discussion groups all put into one short period. And if we destroyed a rifle or bolts and boltheads while learning our trade ....., who cared so long as we learned and got it right eventually.

Next is the one we've all been talking about....., the 7.62 variants. Are you STILL in for the even longer haul?

## **Anyone for 7.62mm CHS?**

**By: Peter Laidler**

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Now for the biggie, the 7.62's. The basic principle of headspacing hasn't changed here but the practicalities have. Whereas before, on our rimmed .303" rifles we measured the GO NO-GO distance between the front face of the bolt and the rear face of the barrel, it's all changed for the rimless 7.62mm NATO caliber rifles. Now we have to measure from the front face of the bolt to the cartridge seating at the neck. Well, that's all pretty clear then ....., except that the neck is tapered so where EXACTLY on that neck do you take your GO, 1.628" and NO-GO 1.635 measurement from? Even if I told you it'd make no difference whatsoever because without the specialist measuring and more importantly, the calibration equipment, you'd still be none the wiser. The trouble with this is that you've got to take the word of the manufacturer of the gauge. And exactly where does HE take HIS

measurement from but more importantly, WHO does he get them from. getting difficult isn't it?

Let me give you an example. My GO gauge gives you a close/GO reading of 1.628 but Bloggs & Co gauge may give you a GO reading of 1.575" for the same 7.62mm caliber. How can there be a difference of .053" between the two when they are identical? Well, it's simple really. Our STANAG gauges are measured from one diameter around the neck while Bloggs & Co are taken from a different but larger diameter .053" further to the rear! That is really all I want to say about that.

The next obvious question for all you enthusiasts is where can I get a set of these gauges and the true answer is that I don't know! But here's what I propose. If you HAVE a set of spurious/said to be/reported to be/hope they are 7.62mm headspace gauges, I will calibrate them for you and tell you EXACTLY what it is you have. The fact remains that there are MANY gauges for all manner of 7.62mm rifles and machine guns ranging from the little bolt action L8's right through to the L- whatever it is ferocious mini gun. And there are equally MANY for different lines of repair and functions, ranging from 1.622" to 1.648".

Once I return them, calibrated, at least YOU know that if the 'unknown' gauge you sent to me to be calibrated comes back as a STANAG calibrated 1.6325 gauge (GO for the L1A1 rifle incidental.....) then it will suffice as a NO GO gauge with your 7.62mm Enfield provided that you slide a sliver of .003" steel shim across the bolt face first, on the basis that 1.632 plus .003 equals 1.635.

On the other hand, if you're clever, you COULD just have the rear face ground down by .0045" to end up with a 1.628" GO gauge.

That just about covers the 7.62mm versions. The question of calibrating your gauges is one that needs to be looked into by 'some friends' on both sides of the pond. I can see already that this is about to open up a whole new can of worms..... But just hang on in there.....