
From: Ronkainen, Jim
Sent: Wednesday, February 06, 2008 3:15 PM
To: Jeff Rooks
Subject: RE: XMP Trigger Pull Study Data[Scanned]
Attachments: 597 Trigger Pull Comparison.pdf; TRIGPULL.pdf

Jeff,

It looks like it might be difficult for us to hook up before next week – I'll give you a quick synopsis of where I am at via email.

Last June, marketing had a varmint hunt with several gun writers to showcase the X-Mark Pro (XMP) trigger assemblies and the SPS varmint rifles. The guns selected for the hunt were shipped directly from inventory in the warehouse (OHL) to our media contact for the hunt without being checked beforehand. When the guns were taken out for the hunt, the trigger pulls seemed to be pretty high, but there was no way to verify the actual trigger pull forces in the field. At the conclusion of the hunt, the guns were returned to marketing in Madison along with a complaint that the trigger pull forces were high. When the trigger pulls were measured by John Trull (method and specific measurement apparatus unknown), four of the eight guns were found to be above the high limit for trigger pull force (trigger pull force > 5.5 lbs). Based on John's measurements and the feedback he received from the hunt, John asked production to take a look at what could be done to improve the trigger pull force setting process to reduce dispersion and lower the mean setting point toward the lower end of the permitted specification (3.5 – 5.5 lbs).

One of the first steps taken in this process was to conduct a warehouse audit the trigger pull forces for rifles with XMP. Fifty rifles of various SKUs were requested and pulled from the Memphis warehouse and drop shipped to the R&D facility in Elizabethtown for the audit. Trigger pull was measured using three different methods. The first method used the equipment (hand pulled Chatillon 10-N spring scale with slider to record maximum force) and technique (3 measurements made parallel to the centerline of the barrel) currently used in production to measure trigger pull forces. The second method used a digital force gage (hand pulled Lyman digital force gage with peak hold for recording the maximum force) and the same technique as is currently used in production (3 measurements made parallel to the centerline of the barrel). The third method used for the audit was a Dvorak TriggerScan gage (digital force gage with a stepper motor for movement of the gage) with a fixture to hold the action as 5 force/displacement measurements are made parallel to the centerline of the barrel. Past experience has indicated that cycling the safety between measurements may have an effect on measured trigger pull. To include this possibility in the test, trigger pull was measured with all three methods both with (SC) and without (NSC) cycling the safety between measurements. The calibration of all three gages was verified prior to commencement of the audit.

The normal course of testing consisted of:

1. Unpack the gun and verify it is unloaded.
2. Mount the barrel of the rifle in the padded jaws of a vise.
3. Make 3 trigger pull force measurements using the Chatillon spring scale and production technique described above without cycling the safety (measurement data labeled Chatillon Spring Scale NSC).
4. Make 3 trigger pull force measurements using the Chatillon spring scale and production technique described above with cycling the safety (measurement data labeled Chatillon Spring Scale SC).
5. Make 3 trigger pull force measurements using the Lyman digital force gage and production technique described above without cycling the safety (measurement data labeled Lyman Digital Scale NSC).
6. Make 3 trigger pull force measurements using the Lyman digital force gage and production technique described above with cycling the safety (measurement data labeled Lyman Digital Scale SC).
7. Remove the gun from the vise.
8. Remove the action from the stock.
9. Mount the action in the Dvorak TriggerScan fixture.
10. Make 5 trigger pull force measurements using the Dvorak cycling the safety between measurements (measurement data labeled Dvorak Device SC).
11. Make 5 trigger pull force measurements using the Dvorak without cycling the safety between measurements (measurement data labeled Dvorak Device NSC).
12. Remove the action from the Dvorak fixture.
13. Reassemble the action to the stock.
14. Verify the gun is unloaded and repack the rifle in its box.

The order the measurements were made in was intentionally selected so that the very first measurements made after unpack matched the process used at Final Inspection and Pack just before the gun was sent to the warehouse. The order of measurements was changed for two guns (#11 and 12) so that the Lyman measurements were made before the Chatillon to see if this had any marked effect on measured trigger pull. The regular measurement order was

resumed with gun 13 and was used without variation for the remainder of the test. One of the audited guns had an old style trigger assembly (gun 12) even though the box end label indicated it had an XMP trigger assembly. Trigger pull data for gun 12 was only used in the statistical tests used to determine whether or not the distribution was normal – the data for this gun was not used in the comparison of the three measurement methods.

The outcome of the audit was that none of the guns were over the high limit when measured with the production method. The Lyman digital force gage yielded greater variability in the measurements than either of the other two methods. The source of the greater variations seen with the Lyman force gage is unknown. The Dvorak yielded higher mean measurements than the Chatillon and showed some of the audited rifles to be over the high limit for trigger pull force.

What I've tried to determine from the data is whether or not one measurement method is statistically "better" than the others. How "better" is defined is somewhat open to question, but I define it as a measurement method that yields a smaller standard deviation when compared to the other methods tested.

My questions for you is does the data I have support one measurement method over the others as being a better method? I can think of some additional testing that could be run to see if the order of the test (Chatillon/Lyman/Dvorak versus some other sequence) had an influence on the data (i.e. could the fact that the Dvorak was tested last have influenced the difference in the sample mean between the methods).

We have conducted previous studies on trigger pull measurement for other firearms that might be of interest (see attached).

Well, I guess that wasn't so short of a synopsis. If you have any questions, please let me know.

Thanks,
Jim

From: Jeff Rooks [mailto:jrooks@cerberusoperations.com]

Sent: Tuesday, February 05, 2008 10:40 PM

To: Ronkainen, Jim

Subject: RE: XMP Trigger Pull Study Data[Scanned]

Jim,

I'll send a meeting notice for us to discuss on Friday morning. Please let me know if we need to reschedule – not sure about your travel schedule this week.

Regards,

Jeff Rooks

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From: Ronkainen, Jim [mailto:Jim.Ronkainen@remington.com]

Sent: Monday, February 04, 2008 9:55 AM

To: Jeff Rooks

Subject: RE: XMP Trigger Pull Study Data[Scanned]

Jeff,

We got caught in the great 2/1 travel debacle in the northeast coming home Friday – we finally made it home via Charlotte at 7:30 pm into Louisville Friday evening. I'm in E'town this morning but will be traveling to Ilion this afternoon, so today is pretty well shot.

I do have some questions for you regarding interpretation and analysis of the data, specifically about comparing the two methods of measuring trigger pull. How does your schedule look later this week? Let me know when you have some time and we can discuss the data then.

Thanks,

Jim Ronkainen
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From: Jeff Rooks [mailto:jrooks@cerberusoperations.com]
Sent: Friday, February 01, 2008 12:03 AM
To: Ronkainen, Jim
Subject: RE: XMP Trigger Pull Study Data[Scanned]

Jim,

I reviewed your Trigger Pull Study presentation. Do you have a specific statistical study you would like to perform as a next step? Or do you want to discuss the data in the attached spreadsheet?

My schedule the last couple days has been crazy and I apologize we didn't find time to discuss your Trigger Pull Study files. If you have questions that require explanation or background information, we should set-up a conference call to discuss. If so, I have some available time tomorrow afternoon or Monday afternoon. If you have a straight forward statistical question about the data, please reply with the question and I'll do my best to answer.

Let me know.

Regards,

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From: Ronkainen, Jim [mailto:Jim.Ronkainen@remington.com]
Sent: Wednesday, January 30, 2008 1:10 PM
To: Jeff Rooks
Subject: XMP Trigger Pull Study Data

Jeff,
Attached is an Excel spreadsheet with the trigger pull data we collected last September as part of a trigger pull study we conducted at the request of marketing. I've also attached a copy of the presentation we made to John DeSantis and Scott Blackwell to report our study's findings as background.

Please let me know when would be a good time to meet to discuss this – my schedule is wide open.

Thanks,
Jim

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