Remington MILITARY PRODUCTS DIVISION

New Sniper Weapon System

04 Jun 2008

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Introduction

The Remington Arms New Sniper Weapon System (NSWS) is a magazine fed bolt action rifle developed from the ever changing requirements being placed upon snipers today. Remington's Military Products Division (MPD) has been in constant contact with our Armed Forces to best learn what features are desired in the next generation sniping weapons platform. In an effort to meet this specific submission timeline, Remington has designed an entirely unique rifle system in a little over three months time. The development process is still ongoing, and the submitted samples represent the initial prototypes.

This document is divided into sections for ease of use. The sections cover the shipped package contents, the basic specifications of the rifle, design exceptions/known issues with these prototypes and Remington's anticipated resolutions, assembly/disassembly and adjustment instructions, and an appendix with additional relevant information.

With the prototype nature of Remington's submission in mind and recognizing that development/improvements are in process, any and all feedback regarding the platform is welcome. Remington wants to and can deliver the absolute best sniper weapon system possible, continuing both our company's and country's long legacy of working together to provide superior equipment for the U.S. Armed Forces.

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Package Contents

1 – Rifle S/N: XC2157
Headspace: min. + .004"
Round Count: 131

1 – Storm Rifle Case

1 – Mobile Armory 50" Soft Rifle Case

1 – Blackhawk Accessory Bag

1 – Spare Bolt Head

1 – Spare Extractor

1 – Spare Extractor Pivot Pin

1 – Spare Extractor Spring

1 – Spare Ejector

1 – Spare Ejector Pin

1 – Spare Ejector Spring

1 – Barrel Nut Spanner Wrench

1 – Spare Front Action Screw

1 – Spare Rear Action Screw

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Package Contents

1 – Rifle S/N: XC2158
Headspace: min. + .000"
Round Count: 51

1 – Storm Rifle Case

1 – Mobile Armory 50" Soft Rifle Case

1 – Blackhawk Accessory Bag

1 – Spare Bolt Head

1 – Spare Extractor

1 – Spare Extractor Pivot Pin

1 – Spare Extractor Spring

1 – Spare Ejector

1 – Spare Ejector Pin

1 – Spare Ejector Spring

1 – Barrel Nut Spanner Wrench

1 – Spare Front Action Screw

1 – Spare Rear Action Screw

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Specifications and Features

- .338 Lapua Magnum CIP
- 27" barrel, 1-9.5" Twist, Modified 5R
- 48" OAL
- 16 lbs. Base Rifle Weight
- Advanced Armament Corp. Muzzle Brake for Titan-QD .338LM Sound Suppressor
- Adjustable Folding Stock
  - Adjustable cheek piece and butt plate for height, LOP, butt plate elevation
  - Dual-latching, right-folding stock with bolt lock feature
  - Accommodates AR grips
- 360° Free-floating Fore End Assembly
  - Modular accessory rail system
    - Integrated recoil lug
- 20 MOA Monolithic Scope Rail With Recoil Lug
- Titanium Receiver
- 3-Lug Floating Bolt Head with Lock up in Barrel Extension
  - Simplified barrel changing
  - Ease of caliber change
  - 60° bolt rotation
- 5 and 10 round Detachable, Center-feed, Double-stack Magazine
  - Capable of accepting up to 4" OAL round
- 40X XMK Pro Adjustable Fire Control
- Serviceable Bolt/Firing Pin Assemblies without Tools
- Remington SuperCell™ Magnum Recoil Pad

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Exceptions/Known Issues and Anticipated Resolutions

Magazines

Due to the short development time associated with the program, the prototype magazines have just begun to arrive. Testing on the initial samples has yielded unfavorable results. The included magazines allow single loading or feeding of two rounds at most. The material and heat treatment is insufficient, causing the feed lips to easily deform and fail to retain the rounds and/or present them in the proper orientation to the bolt face when feeding. This also applies to the floor plate retention. The vendor has, to date, failed to produce magazines that comply to the design specifications and is presently fabricating new magazines with improvements for the heat treat, material, and geometry. As soon as improved magazines become available, they will be forwarded for replacement with the submitted rifles.

Stock and Fore End Assembly

1) Assembly/Disassembly. Present disassembly/assembly of the action to the stock and fore end to the receiver requires the removal of eight socket head cap screws of various sizes. Future generations of the stock will have an access hole in the grip plate for the rear action screw which will reduce this operation to four socket head cap screws of the same size.

2) Magazine Release. The magazine release is aluminum. The next version will be steel to prevent wear when working in conjunction with hardened magazines.

3) Stock Folding Mechanisms. When folded, the butt stock latches with a steel catch into a notch on the aluminum lower receiver. Again to prevent wear, this notch will be a hardened steel insert.

4) Magazine Release Stop. The stop for the magazine release is a hardened dowel, separately inserted into the lower receiver. The change here will see the magazine well opening lowered to stop the release's rotation, eliminating the dowel.

5) Sling Swivel Pocket. The rear sling swivel pocket is meant to accept a hardened steel push-button sling swivel. The pocket is in the aluminum lower receiver and wear may be an issue. The next version will have a hardened insert to lessen the wear chances.

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Exceptions/Known Issues and Anticipated Resolutions

Stock and Fore End Assembly Continued

6) Recoil Lug. The recoil lug has been fabricated out of pre-hard material and has a Rockwell hardness of Rc 32. No issues have been observed around this but in an effort to anticipate any problems, the material will change to AISI 4140 and heat treated to a Rockwell hardness of Rc 37-42, increasing the strength of the part.

7) Monolithic Rail. The monolithic rail prevents re-barreling without removal of the optics platform. Splitting the fore end rail and the receiver rail while maintaining the alignment and 20 MOA grade can potentially solve this problem. This correction will only be pursued if it is seen as a problem by those evaluating the system.

Action Assembly

1) Bolt/Receiver Interface. The bolt presently can bind when operating in a non-linear fashion due to the diametrical relationship between the guide path in the receiver and the bolt body diameter. The guide path has been inadvertently oversized beyond acceptable tolerancing while the bolt bodies are near the minimum allowable tolerance. Excess clearance between these parts amplifies the binding when a side load is applied. Also, the bolt head ways and bolt body guide paths have been EDM'ed into the receivers, leaving a coarse surface finish. Future versions will have the diametrical relationship corrected as well as the surfaces polished.

2) Bolt Release. The bolt release is held in place via a hardened dowel, making removal difficult. To correct this, the next generation receivers will have a tapped hole to accommodate a threaded pin to retain the bolt release.

3) Safety Arms. The safety arms have been welded together, heat treated, and colored to work with the NSWS receiver. Because of time, stamping the part as intended as well as a plating operation were not performed. No issues should occur with the prototype parts, but the next revision will be processed fully.

4) Barrel Nuts. Two of the four holes on both barrel nuts measure under the desired .250" needed to fit the assembly wrench. Future versions will have this corrected.

5) Ejectors. The ejector location in the bolt head is not optimal for the most positive ejection. This will be moved outward from the center of the part, tangent of the bolt shroud. Likewise the spring and ejector geometries will be optimized in the next revision.

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Exceptions/Known Issues and Anticipated Resolutions

Action Assembly Continued

6) Extraction. RUAG ammunition has occasionally caused difficult extraction, similar to what would be experienced in a high pressure load. The chambers used in the submitted rifles comply to CIP/SAAMI specifications. Based upon Remington's inspection of the RUAG brass, it was determined that the sidewall hardness at the web of the shell is well below acceptable criteria. This characteristic has been the root cause for extraction difficulties in many weapons. No other manufacturers' ammunition tested has demonstrated this problem and all have shown acceptable case hardness measurements. See Appendix for more detail. In an effort to make the weapon system more tolerant of ammunition variation, the primary extraction cam on the next generation will be improved.

Coatings

Current Coating:

Flat Dark Earth physical vapor deposition (PVD) scratch resistant coating comprised of zirconium nitride. The color is arrived at by adjusting the mixture of reactive gasses during the PVD coating process. This coating exhibits a low coefficient of friction against itself (0.15-0.20) and has friction characteristics similar to hard chrome. It exhibits a hardness of 65HRc and a coating thickness of less than 0.0001". The current coating is semi-porous and does not provide 100% corrosion protection. The corrosion protection is does provide is similar to 400 series stainless steels which will show light rusting during exposure to extreme corrosive environments (salt-fog chamber).

Production Coating:

A version of the Remington TriNyte coating process. This will be the same PVD coating with an underlayer of 0.0002" of high-phosphorus electroless nickel plate. This coating will maintain all the frictional properties as the current coating with a total coating thickness of approximately 0.0003" (Ni + PVD). The electroless Ni underlayer provides complete corrosion protection by encapsulating the substrate material. This coating will exhibit no perceptible corrosion after 72 hours of salt-fog exposure.

System Weight

Current weight of the base rifle with a 27" un-fluted M/24 contour barrel is 16 lbs. The same rifle with a fluted barrel is approximately 15 lbs. Using a similarly contoured 20" barrel gives a weight of 14.6 lbs. Fluting the 20" barrel reduces the weight to 13.9 lbs. Presently, Remington is pursuing research in carbon-fiber wrapped barrels for weight reduction, increased barrel stiffness, and improved heat dissipation characteristics. When using a carbon-fiber wrapped 27" barrel, the weight is reduced further to 12.9 lbs.

Assembly/Disassembly Instructions

Required Tools

Barrel Nut Spanner Wrench (supplied)
Torque Wrench
Vise with Padded Jaws
3/32" Allen Wrench
3/16" Allen Wrench
5/32" Allen Wrench
9/64" Allen Wrench
1/8" Allen Wrench

Please reference the exploded view and parts list located in the Appendix.

Disassembly

Separating Action Assembly from Stock Assembly

1) Ensure the weapon is unloaded.

2) With the 3/16" allen wrench, remove grip screw (32) and detach pistol grip (16).

3) With the 5/32" allen wrench, remove the three grip plate screws (31) and pivot grip plate (21) towards the magazine well of the stock assembly (36).

4) With the 3/16" allen wrench, remove the two free-float fore end screws (30).

5) With the 3/16" allen wrench, remove the front (29) and rear (28) action screws. Lift the action assembly up off the stock assembly (36).

Assembly/Disassembly Instructions

Disassembly Continued

Removing Free-Float Tube Assembly and Monolithic Rail From Action Assembly

1) Ensure optics are removed from monolithic rail (17).

2) With the 9/64" allen wrench, remove the four receiver scope mount screws (33) from the receiver (1).

3) With the 3/32" allen wrench, remove the three rail mount screws (34) closest to the receiver (1). Slide free-float tube assembly (25) and the attached monolithic rail (17) forward away from the receiver/barrel assembly. Note: The removal of only the first three rail mount screws (34) ensures the recoil lug on the monolithic rail (17) will clear the notch in the receiver (1).

Bolt Assembly Removal and Disassembly

1) Depressing latch on the shooter's left hand side of the stock assembly (36), fold butt stock toward the shooter's right hand side of the weapon.

2) While depressing latch on shooter's left hand side of the receiver (1), remove bolt assembly (5) from the rear of the receiver (1).

3) To remove the firing pin assembly, grasp the bolt body (5) in one hand and rotate the bolt plug (3) away from cam slot in the bolt body (5) until the firing pin assembly becomes free from the bolt body (5).

4) With the firing pin assembly removed, use the tip of the firing pin (14) to push the bolt head pin (9) out of the bolt body (5). Remove the bolt head assembly (4) out of the bolt body (5).

Assembly/Disassembly Instructions

Disassembly Continued

Removing Barrel Assembly from Receiver Assembly

1) Clamp receiver (1) in vise with padded jaws.

2) Using supplied barrel nut spanner wrench, insert spanner tooth into convenient assembly/disassembly hole of the barrel nut (20). Rotate barrel nut (20) counter-clockwise until loose. Unscrew barrel nut (20) by hand the remaining amount and remove barrel nut (20) off the front of barrel (2).

3) Pull barrel (2) out of the front of the receiver (1).

Note: Barrel (2) removal can be accomplished without removing the stock assembly (36) if free-float tube assembly (25) and monolithic rail (17) have been removed prior. Clamping the stock assembly (36) in the vise with padded jaws can assist in the removal process. Caution must be used when clamping stock assembly (36) in vise to prevent crushing of the magazine well.

No further disassembly is recommended for general maintenance and/or barrel change.

Assembly/Disassembly Instructions

Assembly

Reassembly Notes for Barrel to Receiver Assembly and Action Assembly to Stock Assembly

Reassembly is accomplished by reversing the disassembly procedures with the following recommendations:

1) Using the supplied barrel nut spanner wrench attached to the torque wrench, the barrel nut (20) should be tightened to the receiver (1) within the torque range of 30-60 ft-lbs.

2) The receiver (1) must be placed into the stock assembly (36) and pulled rearward until the recoil lug bears against the notch in the underside of the receiver (1). Using a torque wrench coupled with a 3/16" allen wrench, the action screws (28&29) should be tightened through the stock assembly (36) to the receiver (1) with a torque of 65 in-lbs. An M/24 action screw/scope ring torque wrench can be used for this purpose.

Reassembly of Bolt Assembly

1) Insert bolt head assembly (4) to bolt body (5) such that the bolt head pin (9) holes are aligned between the two parts and the extractor (8) is on the bolt handle body (6) side of the bolt body (5).

2) Insert the bolt head pin (9) into the aligned holes with the firing pin hole in the bolt head pin (9) aligned with the axis of the bolt body (5).

3) While grasping the bolt plug (3) insert the firing pin assembly into the rear of the bolt body (5) such that firing pin passes through the firing pin hole in the bolt head pin (9) and the cylindrical section of the bolt plug (3) approaches the rear of the bolt body (5). As the cylindrical section of the bolt plug (3) enters the bolt body (5), align the assembly lobes of the bolt plug (3) with the respective paths in the bolt body (5). The firing pin head (12) should be oriented so the cam surface is just past the the small notch near the cocking cam. Compress the bolt plug (3) until it stops against the bolt body (5) and rotate bolt plug (3) until firing pin head (12) aligns with notch in bolt body (5) near cocking cam.

Adjustments

Cheek Piece Adjustment

1) Elevation of the cheek piece is accomplished by rotating the adjustment dial located in the butt stock assembly. Looking down on the rifle, rotate the adjustment dial counter-clockwise to lower the cheek piece. Raising the cheek piece is achieved by rotating the adjustment knob clockwise.

2) There are two locking set screws located on the shooter's right hand side of the stock assembly near the cheek piece. Once the desired cheek piece elevation has been determined, use an 1/8" allen wrench to tighten the locking set screws until tight against the guide rods of the cheek piece.

Note: With cheek piece elevated, removal of the bolt can best be accomplished by first folding the stock. (see Bolt Assembly Removal and Disassembly instructions)

Butt Adjustment

1) The length of pull is adjustable on the stock assembly in ½" increments. To adjust the length of pull, press and hold the adjustment lock button located on the shooter's left hand side of the stock assembly, just beneath the elevation adjustment dial.

2) Grasping the butt pad rotate the top of the pad towards the shooter's right hand side of the stock assembly.

3) Pull butt pad rearward to desired length of pull and rotate top of butt pad back to shooter's left hand side of stock assembly until it is again in a vertical orientation.

4) Release adjustment lock button.

5) To lock the length of pull adjustment, use the 1/8" allen wrench to tighten the two locking set screws located centrally on each side of the rear portion of the stock assembly.

6) To adjust the height of the butt pad, loosen the two screws located on the shooter's right hand side of the butt plate assembly with an 1/8" allen wrench. The butt plate can then be adjusted vertically to the desired location. Once adjusted to position, re-tighten the screws.

See Pictures 1 and 2

Fire Control Adjustment – See Appendix

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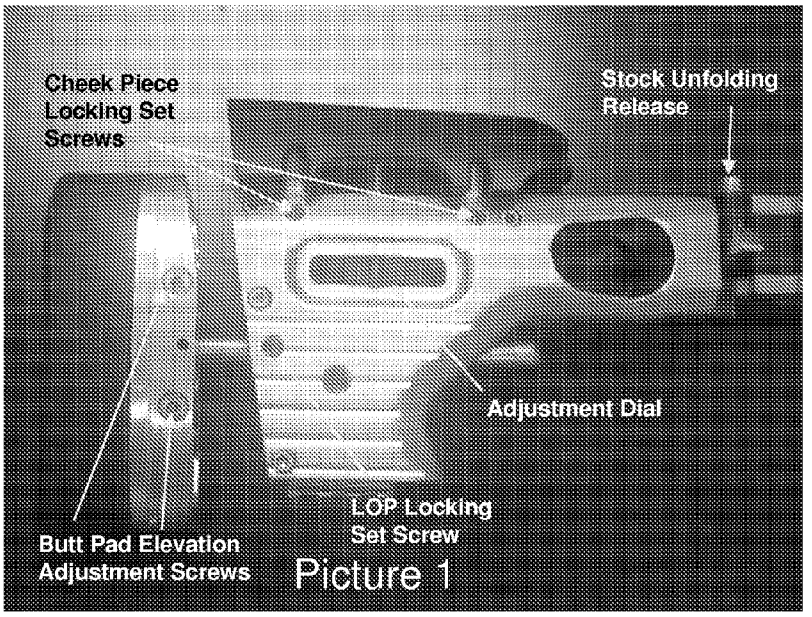
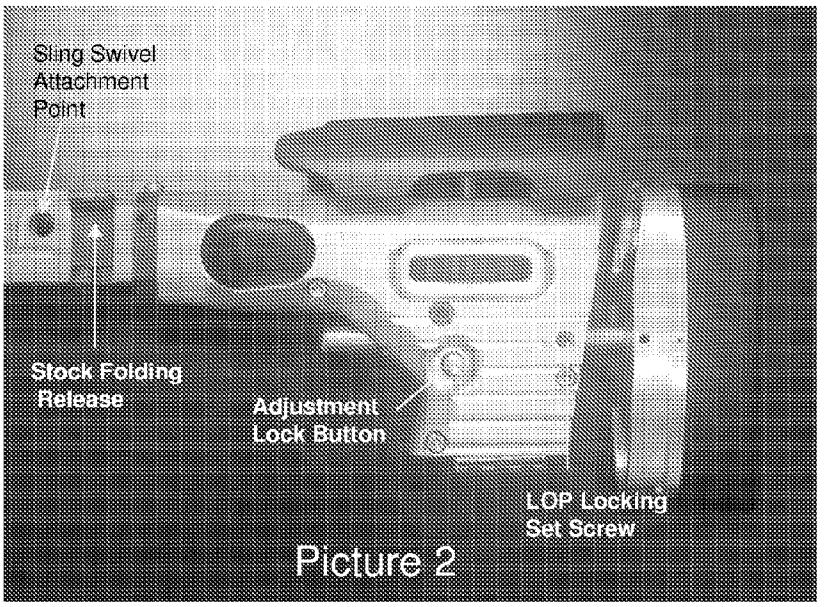
Adjustments



Picture 1



Picture 2

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Appendix

Section 1: Parts List and Exploded View

Section 2: 40X XMK Pro Adjustment Instructions

Section 3: RUAG Brass Hardness Evaluation

Section 4: Contact Information

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Parts List

ITEM NO.	PART NAME	QTY.
1	Receiver	1
2	Barrel	1
3	Bolt Plug	1
4	Bolt Head Assembly	1
5	Bolt Body	1
6	Bolt Handle Body	1
7	Bolt Knob	1
8	Extractor	1
9	Bolt Head Pin	1
10	Barrel Extension	1
11	Fire Control Assembly 40XXmk Pro	1
12	Firing Pin Head	1
13	Firing Pin Body	1
14	Firing Pin Tip	1
15	Adjustable Butt Pad Assembly	1
16	Pistol Grip	1
17	Monolithic Rail	1
18	Magazine	1
19	338 Lapua Mag Round	1
20	Barrel Nut	1
21	Grip Plate	1
22	Trigger Guard	1
23	Supercell Recoil Pad	1
24	Monopod Rail Cover	1
25	Free Float Tube Assembly	1
26	Picatinny Rail, Accessory	4
27	Magazine Release Lever	1
28	Rear Action Screw - 1/4-28 X 1.19	1
29	Front Action Screw - 1/4-28 X.625	1
30	Free Float Forend Screw - 1/4-28 X.625	2
31	Grip Plate Screw - 10-32 x .428	3
32	Grip Screw - 1/4-28 x 1.0	1
33	Receiver Scope Mount Screw - 8-32 x .375	4
34	Rail Mount Screw - 8-36 x .375	12
35	Adj Cheek Piece Assembly	1
36	Stock Assembly	1

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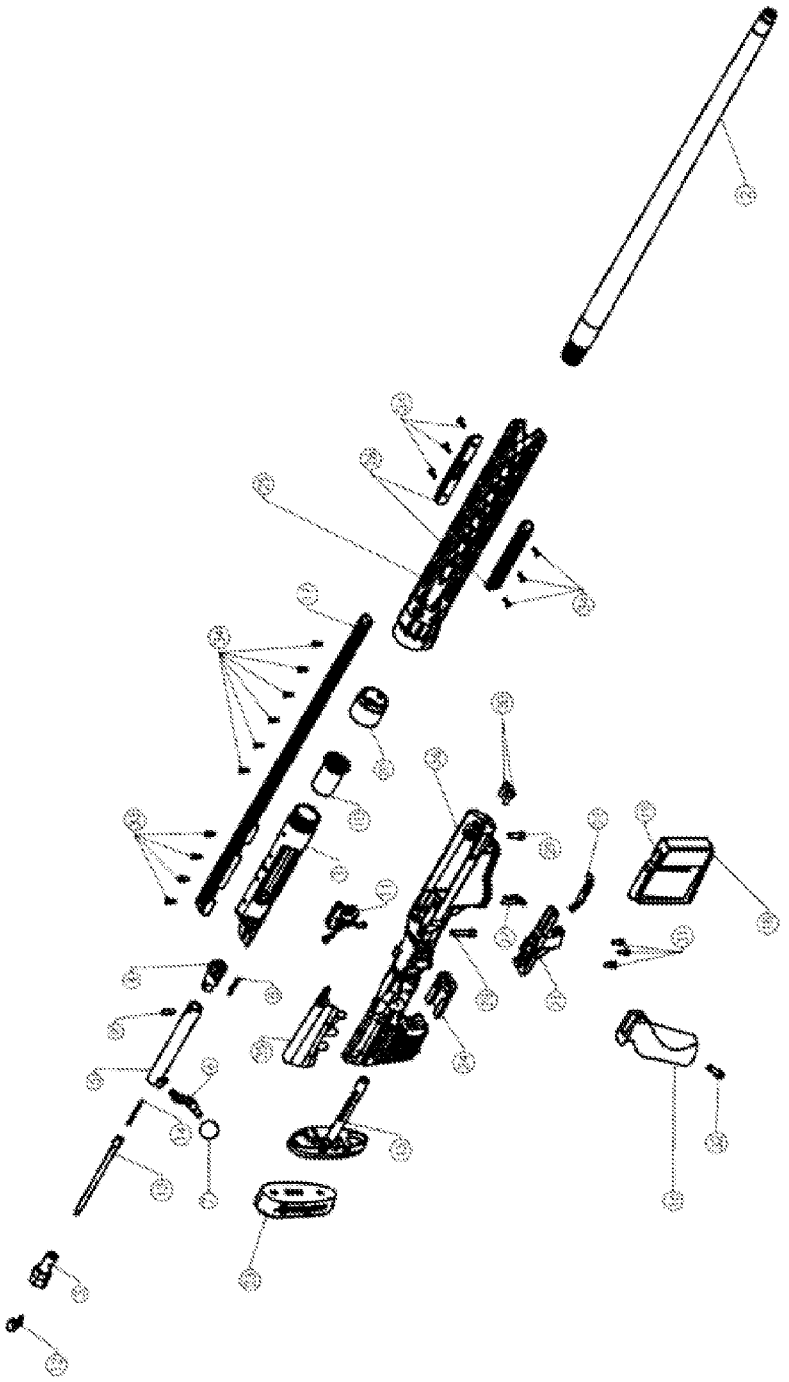

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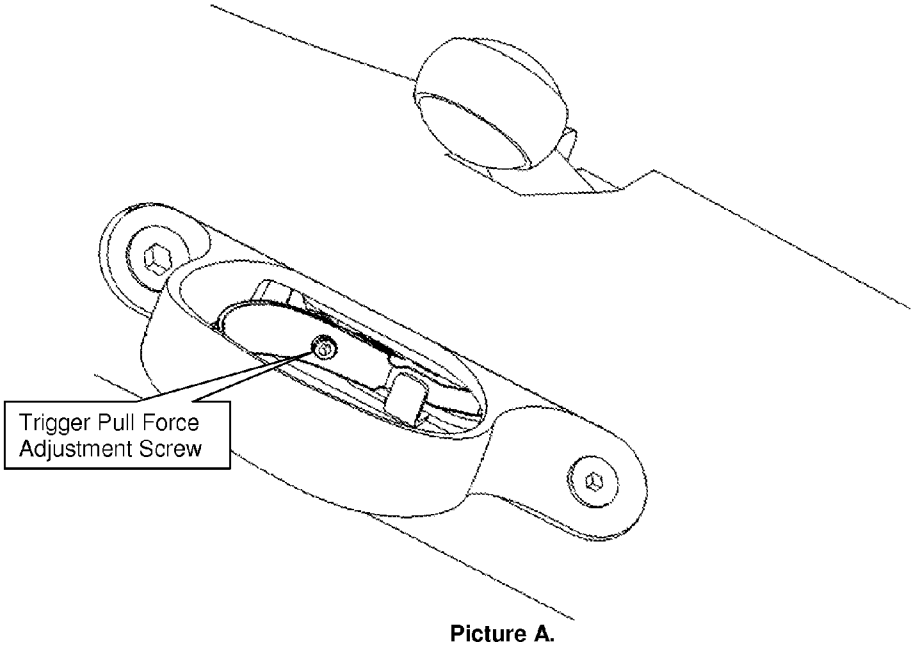
40XMK Pro Adjustment

The Trigger Assembly

The trigger assembly on your rifle permits the adjustment of the trigger pull force by the user. The trigger pull force is adjustable without removing the action from the stock.

WARNING: Only the trigger pull force is adjustable. For safety's sake, **NEVER** make adjustments or alterations to any other parts of the trigger assembly or rifle.
WARNING: NEVER put your finger on the trigger unless you are going to fire the firearm.



Picture A.

To Adjust Trigger Pull Force:

The trigger of your rifle has been preset at the factory in conformity with industry guidelines to have a trigger pull force of at least 3 pounds. However, for competition target shooters firing the rifle from a secure stationary rest in a controlled environment, the trigger pull force can be adjusted downward by the user or a qualified gunsmith using the procedure set forth below.
WARNING: Adjustment of the trigger pull force in this rifle below 3 pounds should only be made for a rifle to be used in competitive target shooting and fired from a secure stationary rest in a controlled environment. For any other purpose, including use in the field, the trigger pull force on your rifle should **NEVER** be reduced below 3 pounds. Remember – regardless of the amount of trigger pull

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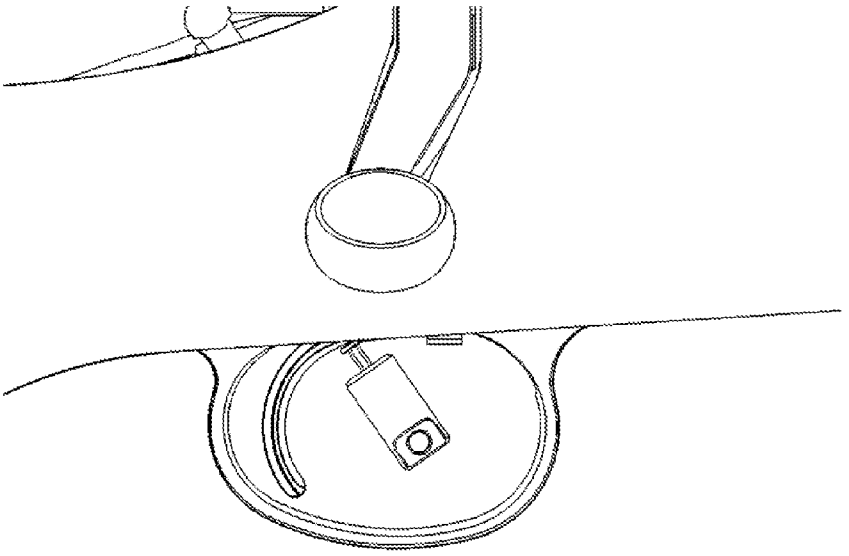
40XMK Pro Adjustment

force, **ALWAYS** keep the muzzle of your rifle pointed in a safe direction to prevent injury or death caused by an unintended or accidental discharge.

WARNING: With the safety mechanism in the **S-SAFE** position, check the chamber and magazine of the rifle to make sure there are no cartridges in the rifle. **NEVER** attempt to adjust the trigger pull force on a loaded rifle.

1. To adjust the trigger pull force, place the provided wrench's hex key in the socket of the adjustment screw as shown in Picture B. A standard 1/16" hex key can also be used to make this adjustment.



Picture B.

2. Adjust the trigger pull force to the desired setting by turning the adjustment screw. Turning the trigger pull adjustment screw counterclockwise will lighten the trigger pull force. Turning the trigger pull adjusting screw clockwise will increase the trigger pull force.
3. After making an adjustment, remove the wrench from the socket of the adjustment screw.
4. Dry fire the rifle several times after making an adjustment to ensure the trigger pull force spring is reseated.
5. Check the trigger pull force with a force gauge or deadweight.
6. Repeat step 5 several times to ensure the proper trigger pull force is maintained.

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40XMK Pro Adjustment

7. If the setting is satisfactory, the adjustment is complete. If the setting is unsatisfactory, follow the instructions outlined in steps 2–6 until you are satisfied.

WARNING: If proper trigger pull force cannot be maintained from pull to pull, then return the firearm to the factory for service. Do not use your rifle if the trigger pull force can not be maintained.

WARNING: The minimum achievable trigger pull force is preset at the factory and must not be altered.

WARNING: Be sure to note if you have adjusted the trigger pull force below 3 pounds when you store your rifle for any period of time. If you expect at any time to loan or sell your rifle or to use the rifle for anything other than competition target shooting from a secure, stationary rest in a controlled environment, you should readjust the trigger pull force to at least 3 pounds.

RUAG Brass Hardness Evaluation

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TLW 2547
TEST REPORT

Case Head Hardness Inspection
RUAG 250 Grain Target
.338 Lapua Magnum

Written By: James Urbon

Requested By: Greg Dennison
Performed By: James Urbon

INTRODUCTION

The firearms design group requested an inspection of the hardness of the case head and base side wall of a sample of RUAG, a Swiss ammunition manufacture, .338 Lapua Magnum brass. Four unfired cartridges of RUAG 250gr. Target ammunition, Lot # 004-05T, were provided for test.

RESULTS SUMMARY

Microhardness inspection of the RUAG cases showed that the Vickers Hardness 0.200", 0.300", and 0.400" from the case head, locations E, F, and G illustrated in figure 2, was in the HV 150 – 170 range. In Comparison microhardness data from previously tested Lapua manufactured brass is in the HV 180 – 190 range for the same locations.

CONCLUSIONS

Experience from previous ammunition development has shown that the hardness of the base of the sidewall needs to be at least HV 180. Cartridges with side wall hardness less than this could experience case swelling and difficult extraction.

PROCEDURE

Samples were obtained by disassembling the loaded ammunition. The cartridge cases were sectioned perpendicularly approximately 0.650" from the head using the Buehler Isomet 4000 precision saw. These pieces were then sectioned longitudinally. The cut was positioned approximately 0.015" past center line so that when the section was polished the test surface would be within 0.010" of centerline. These sections were then mounted in epoxy mounts. For expedience Buehler Epo-Kwick fast cure epoxy was used. Epo-Kwick epoxy cures in approximately half an hour. These samples were designated A1 – A4 and were mounted two per 1.5" diameter mount. The remaining section halves of the four samples were mounted in standard 12 hour cure Struers EpoFix epoxy. These samples were designated B1 – B4. The use of fast cure epoxy enabled data to be generated quickly within a couple of hours. However, the fast cure epoxy does cure hotter than the standard cure epoxy. So the standard cure samples, B1 – B4, were measured as a follow up the next day to confirm the data gathered on the fast cure samples. Due to the kerf of the sectioning saw, the B series samples are approximately 0.050" off center line. This placed the indents in a slightly different position, but should not adversely affect the data.

The mounted case head sections were polished using the Buehler Phoenix 4000 Metallographic Polisher to a sub micron metallurgical finish. The case head and base side wall hardness was then measured on the sections at the standard locations A through I. Figure 1 shows one of the polished case head section mounts. Figure 2 illustrates the standard indent locations. The hardness was measured using the Buehler MicroMet 2001 microhardness tester set at 500g with the Vickers indenter. Prior to inspection the microhardness tester was verified using a calibrated test block in the range of the testing to be performed. Five readings were taken on the 213 +/- 4 test block, the average of which should be within the tolerance of the test block.

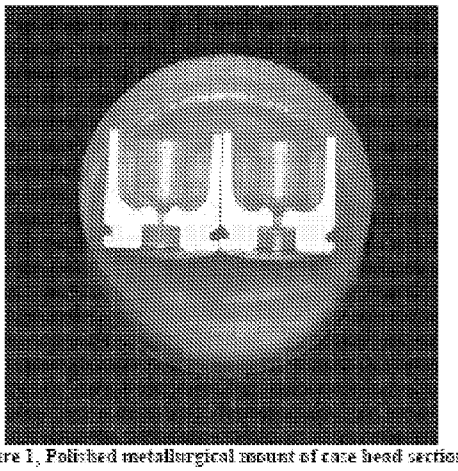

Figure 1, Polished metallurgical mount of case head sections.

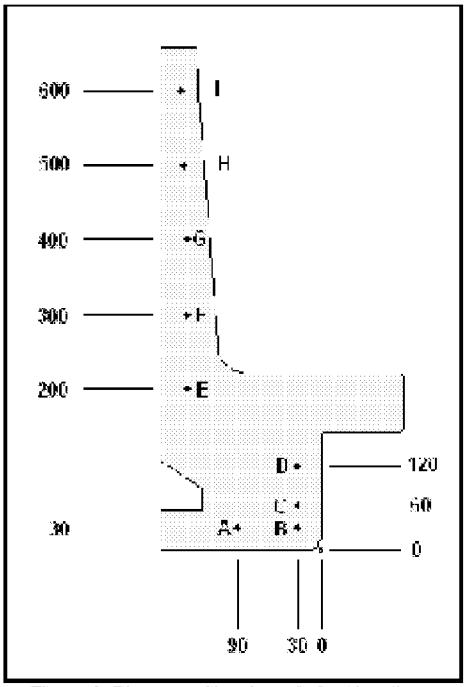

Figure 2, Diagram of hardness indent locations.

DETAILED RESULTS

Figure 3 shows the calibration verification data for the microhardness tester. The average of the five readings is within the range of the test block. The microhardness data for the samples A1 – A4 is shown in figure 4. Figure 5 shows the microhardness data for the samples B1 – B4. As stated in the procedure section, the B series samples are the second halves of the A series sample mounted in standard cure epoxy. The halves were numbered after mounting so A1 is not necessarily the same case as B1. The B-series data confirms that the fast cure epoxy did not have an adverse effect on the measurements of the A-series samples. Figure 6 shows microhardness head hardness data for 10 pieces of standard Lapua manufactured cases from previous measurements taken in TLW 1989. This data is included for comparison. Figure 7 is a graph of the average hardness values of RUAG data and the Lapua data.

Microhardness tester veridification, HV500						
Test Block			213	(+/- 4)		
Data	208	210	215	214	215	Avg 212

Figure 3, Microhardness tester verification data.

RUAG Epo-Kwick Fast 1/2hr Cure Epoxy										
Location	Distance from Case Head	Vickers Hardness, 500g				Average	Max	Min	SD	Avg-3SD
		A1	A2	A3	A4					
A		176	169	171	172	172	176	169	3	163
B		177	164	174	179	174	179	164	7	154
C		178	183	180	187	182	187	178	4	170
D		202	199	202	200	201	202	199	2	195
E	0.2	151	161	156	154	156	161	151	4	143
F	0.3	164	159	156	169	162	169	156	5	146
G	0.4	169	168	166	165	167	169	165	2	162
H	0.5	173	170	165	171	170	173	165	3	160
I	0.6	179	182	176	184	180	184	176	4	170

Figure 4, Microhardness data for RUAG samples A1 – A4.

RUAG Epo-Fix Standard 12hr Cure Epoxy										
Location	Distance from Case Head	Vickers Hardness, 500g				Average	Max	Min	SD	Avg-3SD
		B1	B2	B3	B4					
A		179	172	179	174	176	179	172	4	165
B		169	177	173	176	174	177	169	4	163
C		181	174	185	182	181	185	174	5	167
D		199	207	205	204	204	207	199	4	193
E	0.2	153	153	154	155	154	155	153	1	151
F	0.3	163	158	158	161	163	168	158	4	152
G	0.4	160	163	159	165	164	169	160	4	153
H	0.5	174	173	173	172	174	176	172	3	166
I	0.6	185	174	183	173	179	185	172	6	159

Figure 5, Microhardness data for RUAG samples B1 – B4.

Lapua data from TLW 1989																
Location	Distance from Case Head	Vickers Hardness, 500g									Average	Max	Min	SD	Avg-3SD
		A1	A2	A3	A4	A5	A6	A7	A8	A10					
A–		168	178	178	168	182	176	177	171	172	175	174	182	168	4	158
B		201	212	207	211	202	212	198	211	203	198	206	212	198	5	189
C		196	203	196	198	192	191	195	196	193	198	196	203	193	3	173
D		197	205	199	198	206	204	205	207	194	203	201	207	197	4	182
E	0.2	188	190	187	188	191	193	178	190	181	179	161	187	178	3	172
F	0.3	193	190	190	186	187	188	186	189	193	193	189	193	186	3	181
G	0.4	193	188	188	188	192	188	187	185	190	188	187	193	185	2	183
H	0.5	193	193	189	189	193	195	188	195	200	193	193	200	189	3	184

Figure 6, Microhardness data for Lapua brass from TLW 1989.

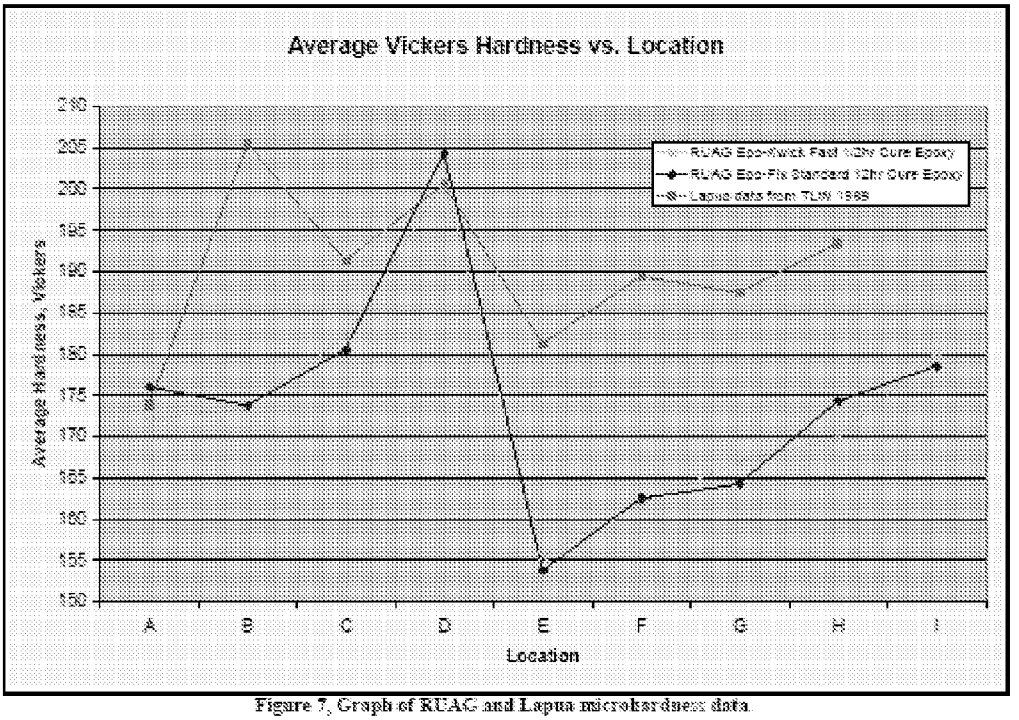

Figure 7, Graph of RUAG and Lapua microhardness data.

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