REMINGTON ARMS COMPANY, INC.

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RESEARCH TEST and MEASUREMENT REPORT – Report No. 820284

M/700 CLASSIC 375 H&H MAGNUM STRENGTH TEST

Prepared by: Edward Yetter, Jr.

Date Prepared: 2-8-82

Proofread and Cleared By:

J.H. Hennings, Foreman-Test Lab / R.E. Nightingale, Foreman-Measurement Lab

Signature Date

C.E. Ritchie,
Sr. Supervisor - Testing,
Meas. & Mech. Analysis Lab

Signature Date 2/22/82

TEST & MEASUREMENT LAB REPORT

REPORT NUMBER: 820284

REPORT TITLE: M/700 Classic 375 H&H Magnum Strength Test

MODEL(S): M/700 Classic

GAGE OR CALIBER: .375 H&H Magnum

DATE: 2-8-82

WORK ORDER NO.: C-1803-000

PART NAME:

DESIGNER/ENGINEER: F.E. Martin

TEST TYPE:

I. PHOTO LAB

2. X STRENGHT TEST- NO. OF GUNS TESTED 1

3. FUNCTION TEST- NO. OF GUNS TESTED _____

4. ACCURACY TEST- NO. OF GUNS TESTED _____

5. X MEASUREMENTS- TYPE: Pressure and Strain

6. ENVIOROMENTAL TEST

7. AMMUNITION TESTING & EVALUATION- TYPE: _____

8. VISUAL EVALUATION- _____ OUT OF _____ GUN SAMPLE

9. ENDURANCE- NO. OF GUNS TESTED: _____

NO. OF ROUNDS PER GUN: _____

TOTAL ROUNDS FIRED IN TEST: _____

AMMO TYPE: MAGS. _____; TARGET: _____

RIMFIRE _____ CENTERFIRE: _____

Report No. 820284
M/700 Classic 375 H&H Magnum - Strength Test

ABSTRACT

A high pressure test was designed for the .375 H&H Magnum M/700 Classic to evaluate strength. This test provided a good opportunity to experiment with new measurement equipment and techniques. Several rounds of factory, SAAMI, and handloaded ammunition were shot with measurements of receiver strain and pressure taken using strain gages. Some computer analysis was also made.

SCOPE OF TEST

To determine the strength of a M/700 receiver and barrel in Caliber .375 H&H Magnum.

TEST RESULTS

The receiver strain from the high pressure load (chamber pressure - 176,000 psi) was 43% of yield strain for that material. At that pressure, the bolt froze in the receiver with no other damage noticed. The receiver strain at proof load was only 17% of yield strain. A further result of this test is evidence to the accuracy of chamber pressure measurements using a strain gage mounted on the chamber section of the barrel.

Report No. 820284
M/700 Classic 375 H&H Magnum - Strength Test

REPORT TEXT

The gun used was a M/700 Classic, Serial No. B6346231.

SAAMI rounds were fired to provide a base line. Chamber pressure averaged 63,871 psi over 10 shots. Some factory and proof ammunition was also fired.

A strain gage was mounted on the receiver to measure radial strain. The full range of ammunition was fired through the gun and strain measured. Strain was very low and did not follow pressure (that is, when pressure went down, strain did not always go down and vice-versa). Another gage was mounted to measure longitudinal strain and more shots fired. Longitudinal strain was of slightly higher magnitude than radial and followed pressure. This direction was assumed to be the principal stress at that point.

Several handloads were made with various powder weights to provide a workup of pressure vs. powder weight. Curve fitting this data yielded a formula with 97% certainty.

Powder (grains) = 32.419 + 20.962 Log pressure (psi x 1000)
(Computer printout in appendix)

Handloads

300 grain bullets

grains 4198 powder	
1	45 gr.
1	64 gr.
3	47 gr.
3	50 gr.
3	53 gr.
3	56 gr.
3	57 gr.
1	77 gr.

After an initial series of shots to establish a pressure base line, receiver strain was measured on every shot.

From this point the theoretical pressure of 180,000 psi was calculated for 77 grains of 4198 powder (max. load for case). This load was made and fired. A pressure of 176,369 psi was measured (curve in appendix). This shot froze the gun's action.

TEST PROCEDURE

A program was written on the HP85 Computer to take the barrel dimensions, compute the strain to pressure constant, acquire the maximum strain from the Tektronix 7854 scope and print out the converted pressure.

A strain gage was mounted on the barrel to measure radial stress. Its location was determined as follows. The exact position of the bolt face was determined using a cleaning rod. A cartridge was placed at this mark and a new mark struck on the barrel at the neck of the case. This is the strain gage location.

Two gages were mounted on the receiver behind the barrel. One gage was mounted radially, the other longitudinally. The following ammunition was used in this test:

SAAMI	375 - 300 - 1 - R
Rem.	375 w/ 300 gr. bullet
Rem.	375 w/ 270 gr. bullet
Rem.	375 Proof

EWY:T

A P P E N D I X

REMINGTON ARMS COMPANY, INC.
Ilion Research Division

SUMMARY OF INTENTIONAL GUN ABUSE TEST

DATA

By R.E. NIGHTINGALE

Date 2-2-82

FIREARM: Make REMINGTON Model 700

Grade CLASSIC Gauge 375 H&H Serial Number B6346231

Origin CUSTOM SHOP

Test Number Assigned WR # 820284

Comments STRENGTH TEST

HISTORY: Condition NEW

Previous Rounds Fired 35 RDS

Headspace at Test

Test Date 2-2-82

ABUSIVE LOAD USED: Powder Type H198

Powder Weight 77 GRS

Case Make and Type REMINGTON

Total Bullet Weight 300 GR.

Total Shot Weight

Estimated Pressure 175,000 (STRAIN GAGE)

ADDITIONAL COMMENTS: MOUT SIDE DAMAGE.

LARGE HAMMER USED TO DRIVE BOLT HANDLE TO OPEN BOLT.

THERE IS CHAMBER SET (.450 +/-)

SAAMI 375-300-1-R

PRESSURE [psi]

65997.5
63124.7
65741.0
65638.4
65125.4
64125.0

60611.0
62739.9
64868.9
60739.2

63871.1

FACTORY 300gr.

PRESSURE [psi]

57612.0
58994.0
58609.2

58405.1

270gr

PRESSURE [psi]

48606.8
44092.4

46349.6

SAAMI 61867.8

270gr 45092.7

Note: All pressures are calculated from chamber strain.

SAAMI

RADIAL RECIEVER STRAIN

PRESSURE [psi]	STRAIN
65971.8	286.3
62714.3	281.5
62970.9	302.3
68100.6	282.8
64586.7	280.2
64868.9	296.4

300gr

54070.3	308.3
53813.7	299.5
60585.3	303.5
59585.9	308.7
57584.3	312.0
57127.7	306.1

Proof

PRESSURE [psi]

94699.8
86902.2

90801.0

220gr.

PRESSURE [psi]	STRAIN
50813.7	286.3
49553.8	281.5
44169.3	291.3
49196.7	290.6
48196.4	287.5
48386.2	287.3

CALIBER: 375MAG
Inside Radius= .405
Outside Radius= 1.134
Modulus= 30000000
Constant= 102.6

PRESS.=CHAMBER STRAIN*CONSTANT

LONGITUDNAL RECIEVER STRAIN

PRESSURE [psi]	STRAIN
SAAMI 61790.9	324.0
300gr 56532.6	188.6
270gr 50402.3	174.0
45gr 4198 Handload 42117.3	120.3

~~modified~~ ~~3 shots~~

PRESSURE [psi]	STRAIN
Proof loading 64gr 106242.3	447.0

PRESSURE [psi]	STRAIN
~~103221.3~~	~~882.8~~
92442.6	882.8
103215.6	452.0

47gr 4198 300gr

PRESSURE [psi]	STRAIN
47683.4	149.1
42784.2	124.7
43040.7	117.4
44502.8	130.4

50gr

51607.8	182.0
49476.9	116.1
50543.3	149.1

53gr

55121.9	169.9
54249.8	201.7
54685.8	185.8

SAAMI

PRESSURE [psi]	STRAIN
64638.0	244.4
64638.0	244.4

56gr

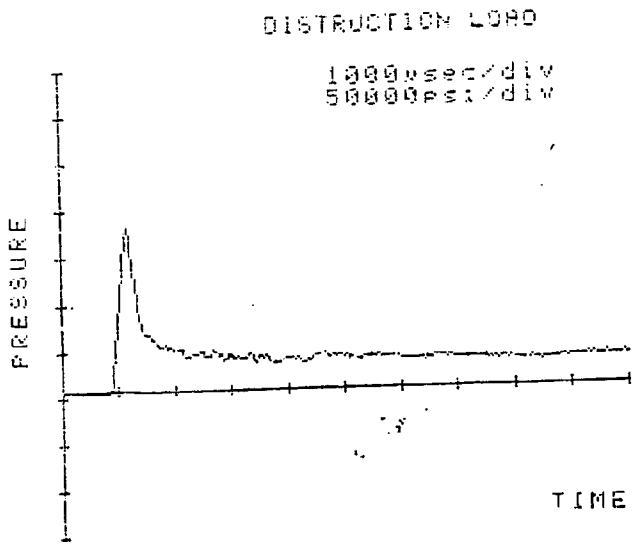
68895.9	282.3
74154.2	287.0
65022.8	217.5
69357.6	262.3

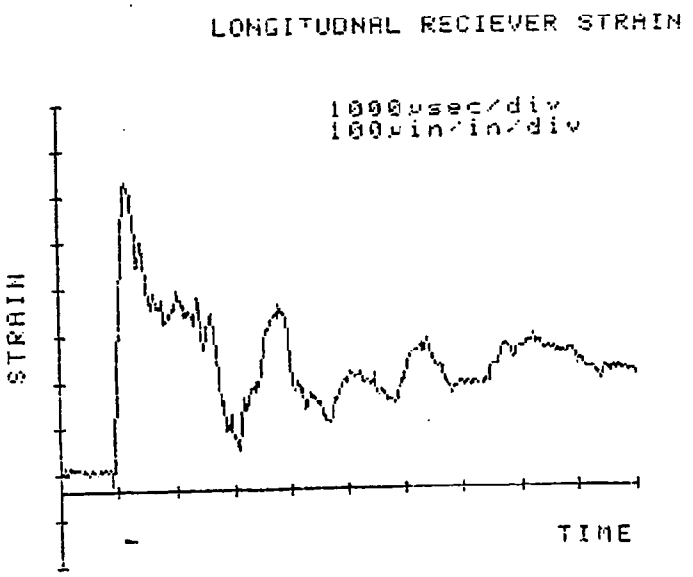
57gr

PRESSURE [psi]	STRAIN
61502.7	221.2
72769.1	305.5
60867.5	222.4
65048.4	249.7

DISTRUCTION LOAD

PRESSURE [psi]	STRAIN [uin/in]
176369.4	686.5





COMPUTER PRINTOUT OF LOG
CURVE FIT OF PRESSURE VS
POWDER GRAINS

ANOV: LOG REG.CODE 2

SOURCE/DF	SS	MS	F
TOTAL 5	237.5		
REG 1	233.8	233.8	255.5
RESID 4	3.7	0.9	

R SQUARE = 0.985

YHAT= -32.419+ 20.962LOG X

Empirical formula
yHAT = Powder grains
x = Pressure

X(I)	Y(I)	YHAT	RESIDUALS
42.00	45.00	45.93	-0.93
44.50	47.00	47.14	-0.14
50.50	50.00	49.79	0.21
54.60	53.00	51.43	1.57
69.40	56.00	56.46	-0.46
100.60	54.00	54.24	-0.24

X(I) YHAT

150.00 72.62
X(I) YHAT

180.00 76.44
X(I) YHAT

185.00 77.01
X(I) YHAT

190.00 77.57